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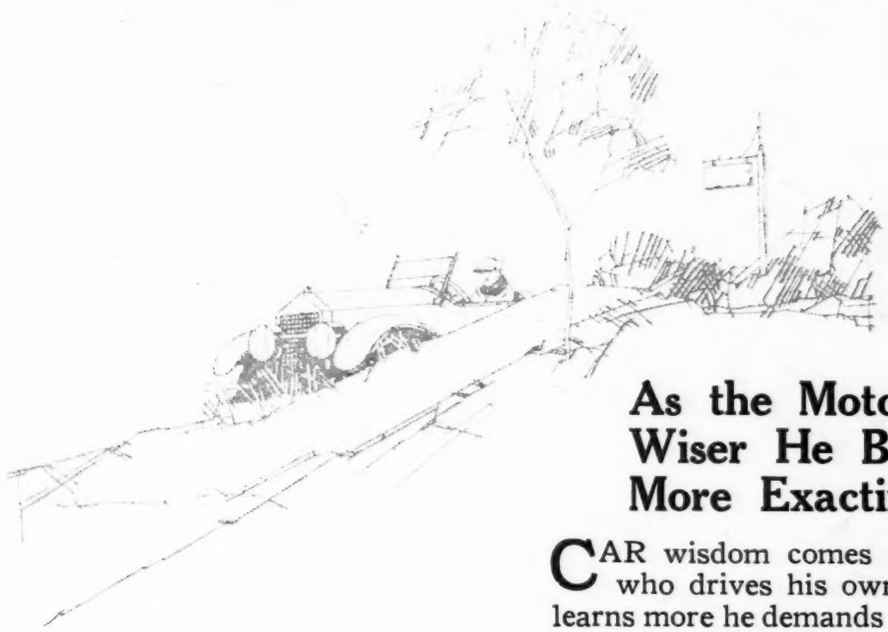

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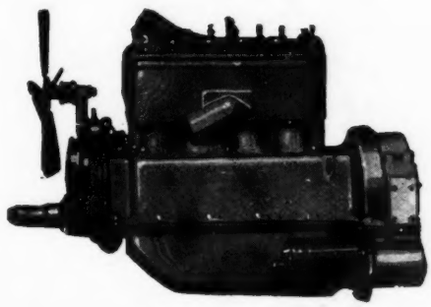

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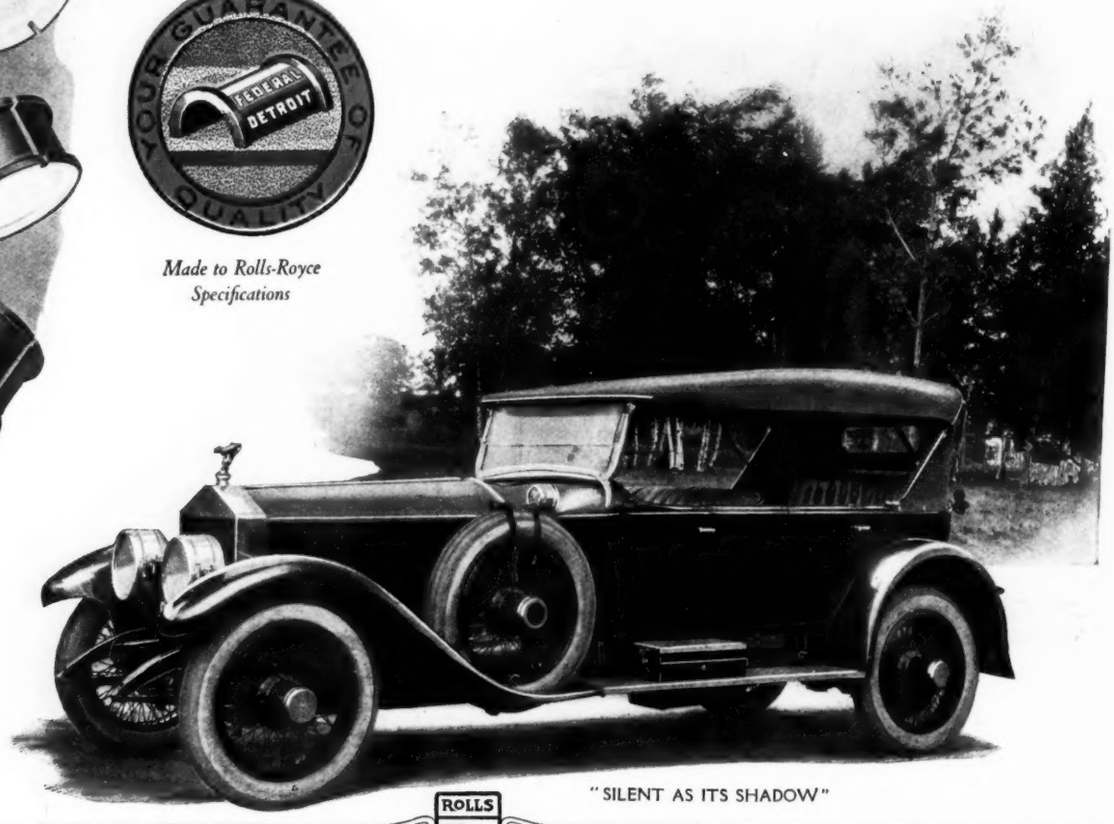

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLVI. NEW YORK—THURSDAY, APRIL 13, 1922 No. 15

Good Business for Rest of Year Seems Assured

Sales in all branches of industry large. Country recovering from depression. Repetition of 1920 slump improbable. Higher prices for farm products chief factor in recovery. Large farm market for low priced cars and small trucks. Parts sales large.

By James C. Dalton

BUSINESS is so good in the automotive industry that most of the people engaged in it are going around with their fingers crossed. It seems almost too good to be true and they're afraid they'll wake up to find it a beautiful dream. The transition has been almost as sudden and startling as the sun breaking through the clouds after an April shower, bringing a rainbow with it.

Even now, with a wonderful March business behind them, many manufacturers and dealers are supplementing their statements—in private—with the observation that it "may be only a flash in the pan."

It isn't.

The automotive industry has emerged definitely from the long period of depression. Many tangles remain to be straightened out and there are many problems to be solved, but business will be good for some time to come.

There are seasonal declines in the sale of motor vehicles just as in most other industries and the sales curve will not always move upward, but a period of years will elapse before it gets another such jolt as it did in 1920. If the industry has learned its lesson there may never be another such sickening loop-the-loop from the peak of prosperity to the slough of despond.

An astounding improvement in general business conditions in the United States has come in the last eight weeks. At the end of January it seemed that little progress had been made on the road to recovery. Then the wind changed, almost over night, and confidence was rolled up like a giant snow ball.

Confidence was all that was lacking. It hasn't come back in normal measure and most people still are hesitant, but they have ceased to shy at every shadow and they are not looking constantly for ghostly manifestations by evil spirits.

AUTOMOTIVE INDUSTRIES made the following prediction in its issue of Dec. 29, 1921:

"So far as passenger cars are concerned, the first quarter of 1922 will be materially better than the corresponding quarter this year; the second quarter a little better than in 1921, the third not quite so good, and the fourth considerably better. The truck market will improve with general business."

The first quarter of 1922 is history and it more than came up to expectations. There need be little hesitancy in saying now that the second quarter will do the same. April is certain to be at least as good a month as March, which was the best in two full years. It is practically assured that May will equal the volume of April and there need be little doubt about June.

Beyond June the outlook is somewhat obscure. It would not be surprising if July brought the midsum-

mer slump which has been perennial with the industry except in 1920 and 1921. Conditions last year were abnormal. Beginning with March, sales and production ran along on practically an even keel for eight months. There was no sharp falling off in the middle of the summer. In fact, the third quarter was a trifle better than the second. That condition may prevail again this year, but if it does it will be a distinct surprise.

In 1920 March was the biggest month of the year with shipments of 29,336 carloads and 57,273 driveaways. April brought a sharp slump with only 17,147 carloads but 64,634 driveaways. Part of the decline in shipments was due, however, to a shortage of freight cars. Shipments for the second quarter as a whole were not as large as in the third quarter.

Volume of Truck Sales Will Increase

The last quarter both in 1920 and 1921 showed a very marked falling off. The reverse is likely to be true this year. It would not be in any sense surprising if October, November and December brought a larger total of sales than the three preceding months. There is certain to be throughout the country a strong demand for enclosed passenger cars and the farm markets probably will be stronger than at any time during the year, especially in the South. So far as the agricultural districts are concerned, truck sales will increase in volume as the year progresses, probably reaching their peak at harvest time in the various zones, or immediately afterwards.

Considering all the factors involved, the automotive industry can safely view the remainder of 1922 with serenity. So far as passenger cars are concerned, the volume assuredly will be as large as last year and in all probability larger. The number of light trucks sold will be two or three times as large and in the heavy duty field last year's sales record undoubtedly will be doubled. The parts and accessory manufacturers can count on business at least double the aggregate of 1921 and in all probability much more than that.

While it is conservative to say that business in 1922 will be good for the industry as a whole, this is no time to take the brakes off and disregard caution. After the lesson of 1920 it is not likely any manufacturers will go very far in piling up an inventory. The same should be true in respect to surplus stocks of completed vehicles. Manufacture should be held closely to sales demand. The industry has plenty of factory space for a long time to come.

It probably will be at least a year before the industry is sufficiently stabilized to expect the placing of commitments for supplies for more than a month or two in advance.

Reasons for Prosperity's Return

The fundamental reasons for the return of prosperity and confidence are not hard to find. They were:

Higher prices for farm products, more cash and more buying in agricultural districts.

A general increase of operations in industrial centers and less unemployment.

This tells the whole epic story of the transformation from deep depression to comparative prosperity. The country as a whole is not yet out of the woods, but it is coming through. Conditions are vastly better than they were a year ago.

Higher prices for farm products, such as grain and cotton, wrought the change. There was an immediate increase in the purchasing power of the farmers who constitute half the entire purchasing power of the country. This reached back to the mills and factories which took on additional workers. When these operatives went back to work they began purchasing goods at retail. This brought more orders to the wholesalers which went back to the producers.

Thus the circle was completed. It was another demonstration of the time honored economic law that there can be no general prosperity when any one great section of the population is not prosperous.

In reporting the agricultural conference at Washington in its Feb. 2 issue, AUTOMOTIVE INDUSTRIES said:

"Motor truck manufacturers who study, analyze and develop farm markets will be the ones who will reap the rewards in the near future."

That prediction, improbable of fulfillment as it seemed at that time, was fully vindicated in less than six weeks.

Watch those farmers! They're coming back. They felt for two years with considerable reason that they weren't getting a square deal. They accused the whole world of skulduggery against them. They couldn't get enough out of their crops to pay the cost of raising them. They owed money to everybody who'd trust them. Their creditors needed the money. In a good many cases they were having a terrible time to keep three jumps ahead of the sheriff.

The farmer hates debt. It hurts his pride not to be able to meet his notes when they're due. He prides himself on his honesty. When he sold some wheat or corn or hogs he dragged the old automobile out of the barn, shuddered at the way it rattled and the engine knocked, pumped a little air into the decrepit tires, climbed into the driver's seat and called his wife to go along with him. He drove to town and stopped at the village bank. Then he dug his lean looking roll out of his pocket and went in to whittle down the notes again.

While the head of the family was paying for a fraction of the "dead horse," which might represent the seed he bought in the spring, his wife was window shopping. She was looking longingly at the ginghams and the dresses and the millinery. Looking was all she could afford. If she bought anything it was a pair of cotton stockings or something she couldn't get along without. Maybe they took home a bag of peanuts or candy for the kiddies. That was all except the canceled note.

The Tide Turns

Then the tide began to turn, as tides always do. With the exception of tobacco every agricultural product for which prices are given in the "Survey of Current Business" issued by the Department of Commerce, showed a substantial increase in February over January. Compared with December, the improvement is still more marked. The price of hogs in Chicago increased 45 per cent in two months. Sheep and lambs increased from 40 per cent to 70 per cent. Wheat and corn each rose about 20 per cent. Wool went up to 28 per cent while cattle and the minor cereals showed substantial gains.

Although cotton is slightly higher than in January, it is below the price reached in the last quarter of 1921. While February was a shorter month than January, the daily average consumption of cotton in the mills was about the same. Compared with a year ago, there was an increase of 20 per cent in consumption notwithstanding the widespread labor troubles in New England mills.

There were fluctuations in March in the prices for farm products, but on the whole they were high enough to take a good share of the gloom out of the farmer's heart. He always is happier in the spring, anyway, when he can get at his planting. But he is a lot more cheerful this spring than he was last. It begins to look to him as though the worst was over, that he will be able to pay his debts and have a little left to buy some of the things he wants but doesn't actually have to get.

Among the things the farmer wants more than any-

thing else are inexpensive motor cars and light trucks. He's going to have them if he can. A questionnaire sent recently to a large number of farmers in Washington, Oregon and Idaho brought the information that more of them proposed to buy motor vehicles than anything else except supplies needed for agricultural operations. This situation is typical.

After two long lean years the men in the rural districts who deal in motor vehicles, equipment, accessories and service, are going to find their business very much better in 1922. In fact, they may be better off than their city brothers.

The Farmer Is Going to Buy

The average farmer is going to buy something, at least, from them. And not all farmers are average. Thousands of them have money in the bank and there are many sections where they have been making some money right along. They have been disgusted at general conditions, however, and have refused to buy on general principles. Now they are convinced that the farmer is coming into his own and they are ready to go into the market.

But they must be SOLD the goods they want. It won't be enough to sit on the front porch and wait for them to come along. The merchandiser who does business with them has got to work and work hard. They will buy where they think they can get the most for their money.

It will pay to cultivate the farmers this year. Even in the Dakotas where they are poorer than almost anywhere else, there are prospects in every district. If the automobile dealer or service man will dig them out he can sell them something. From an automotive point of view 1922 won't be the best year on record in the agricultural sections, but it will be so much better than the last two have been that it will seem like genuine prosperity. Business will get better steadily as the year advances, reaching the peak at harvest time.

In selling automotive equipment to the farmer it isn't necessary to sell him on the value and utility of motor vehicles. He's sold already. All he needs is the cash or credit to buy them. He will think several times before he'll buy a passenger car on credit, but if he can be shown that a light truck will lower his marketing costs and increase his profits, he will buy one on time.

Trucks of one-half, three-quarters and one ton capacity are going to be mighty good bets in the rural communities, and it wouldn't be surprising if more money were made on them this year than on passenger cars. That's a market every dealer should study earnestly.

The villages of the country, except those which are close to big centers of population, are mainly dependent on the farms for their prosperity. As the farm market grows, their business expands. Even the doctors and dentists and lawyers in these towns have had to take notes from their farm patrons the last two years. With the payments made on these notes, they will be likely to buy the motor cars or equipment they need.

With the village merchant selling more goods, he'll have to order more freely from the city wholesaler or jobber. These orders will move back to the mills and there will be more work in the factory towns.

For example, when a few farmers in North Dakota sell their goods at what they think is a fair price, they may decide to buy sewing machines for their wives. If they do, it may be a big help to Elizabeth, N. J.

It is easy to see, therefore, that the automotive dealer in every part of the country is going to be helped by higher prices for wheat or pigs or eggs.

The United States has gone far in its readjustment from a war to a peace basis. That readjustment never can be finished completely until the rest of the world gets back to par, as it were. A long time must elapse before that much to be desired condition can be achieved, but steady progress is being made in that direction, and it is more rapid than appears on the surface.

Full prosperity never can be restored in this country until foreign countries can absorb the surplus of raw materials and manufactured products which the United States can produce. That makes all the difference in the world so far as profits are concerned. But the export market is improving rapidly. The American manufacturer of motor vehicles and equipment who is going after export business intelligently is getting it. The increase in the value of the British pound sterling has helped amazingly.

A lot of things remain to be done in this country before normal conditions can be entirely restored. Some of them are:

Sane revision of the tax system.

Reduction of governmental expenditures.

Permanent settlement of the tariff on a sane basis.

Reorganization of Federal machinery so it will give more efficient service.

The refunding of foreign loans so they can be reduced gradually.

Assistance to exporters and the safeguarding of foreign commerce.

Assistance to the farmers through supplements to the normal banking machinery and by the mobilization of private credit to finance cotton, cattle and other commodities.

Development of water power resources and the elimination of waste in production and distribution.

Legislation never can be a panacea for economic ills, but wise action by Congress will do much to solve some of these pressing problems.

The business world already has done much to right itself and the readjustment has come about with less disturbance than might have been expected. There has been no actual money panic, as there would have been except for the Federal Reserve system and as there always has been in previous periods of great depression.

CONSIDERING all the factors involved, the automotive industry can safely view the remainder of 1922 with serenity. So far as passenger cars are concerned, the volume assuredly will be as large as last year and in all probability larger. The number of light trucks sold will be two or three times as large and in the heavy duty field last year's sales record undoubtedly will be doubled. The parts and accessory manufacturers can count on business at least double the aggregate of 1921 and in all probability much more than that.

Automotive Industry Fortunate

So far as the automotive industry is concerned, it has been exceedingly fortunate. The percentage of casualties has been relatively light. Failures there have been, but they have been comparatively small and they have not shaken the structure of the industry. Last year was the third best the industry ever has had and this year will be fully as good. It will be considerably better except, perhaps, in the sale of passenger cars. The total in that field is not likely to go much ahead of last year, but it must not be forgotten that more than 1,500,000 cars were sold in 1921.

Factories are co-operating with dealers as they never did before. They are considering the questions of finances, used cars, service and satisfied customers. They are thinking in terms of quality and their engineers are working on mechanical improvements. Greater mileage per gallon of gasoline and lower maintenance costs for motor vehicles have become mighty big factors. Keen competition is a business stimulant.

Manufacturers are competing for competent dealers. They are glad to make contract concessions to get the right men, and they are looking at the vital problems of the industry in a broader way. They realize that all its component parts must be prosperous and happy if it is to be happy and prosperous as a whole.

Builders of motor vehicles have liquidated their inventories and taken their losses, staggering as they have been in some cases. They have done everything possible to lower production costs and overhead expenses. The consequence has been that they have been able to make drastic price reductions. These reductions have been passed on to the ultimate purchasers and they have not been absorbed by the middleman as they have been in most other industries. As a result purchasers have no grievance. Even the farmers admit automobile makers have been fair on the question of prices.

Prices seem to have been fairly well stabilized in the passenger car field, although reductions may be expected here and there throughout the year. Truck and tractor makers have brought their prices down as sales have felt the stimulus of improved business conditions generally and competition has forced them to act.

The hearts of the great basic industries are throbbing with a stronger beat. Idle freight cars are rapidly decreasing in number. Bank vaults are bulging with funds awaiting investment in sound enterprises. Interest rates are going lower all the time. The nation finally has conceded that motor vehicles are essential to its life and that even passenger cars are not "pleasure" vehicles.

There are a few clouds left on the automotive horizon, but the sun has broken through and there are big patches of blue sky. The automotive merchant who whistles as he works and who works hard will have a good year and when he balances his books at the end of December he will find he has prospered.

Bristol Gas Starter for Multi-Cylinder Aircraft Engines

THE Bristol gas starter, designed for starting aircraft engines of six or more cylinders up to 500 hp., is a product of the well-known British aircraft manufacturing concern. It may be operated from inside the fuselage and during flight, may be installed in any convenient position, away from the engine if necessary, and weighs only 40 lbs. Inasmuch as the hand magneto and dope pump required when no motor type of starter is fitted are dispensed with, it is claimed that there is really a saving in weight.

The starter consists of a small air-cooled single cylinder two-stroke engine, and a pumping cylinder. The latter draws combustible mixture from the carbureter, supplying the two-stroke power cylinder, and pumps the mixture under pressure to the main engine cylinders.

Interposed between the pumping cylinder and the main engine cylinders is a small disc valve distributor, driven by suitable gearing from the main engine, at one half engine speed, and which passes the compressed gas to each cylinder:

(1) When on its firing stroke.
(2) When on a portion of its induction stroke.

To avoid loss of pressure through the open inlet valves on the induction stroke, the port in the distributor in communication at this period is controlled by a spring loaded ball valve, arranged to open at about 40 lbs. pressure. A non-return valve is fitted to each cylinder, which effectively isolates the starting apparatus when the main engine is running.

The gas starter is fitted with a two-cylinder magneto, from which one ignition lead is taken to the spark plug of the two-stroke power cylinder, while the second lead is taken to the central terminal of the distributor on one of the main engine magnetos.

Method of Operation

The two-stroke engine is started by means of the lever provided, and under the pressure of gas supplied to the cylinders the main engine begins to turn. At the same time gas is admitted into the cylinders during the period of the induction stroke, this gas passing through the cylinders and open inlet valves, and filling the induction system. After one complete revolution, therefore, the whole induction system is filled with gas, which is drawn in on the next induction stroke, and by opening the short circuit switch between the starter magneto and main engine magneto, the engine will fire and pick up on its own carbureters. It will thus be seen that the gas starter supplies both gasoline and ignition to the main engine for starting. It is claimed that engines up to 500 hp. when cold are turned round at the rate of 12-15 r.p.m. The induction pipe of the gas starter is so arranged that the pumping cylinder gets a richer mixture than the power cylinder, which is necessary on account of the subsequent dilution when the mixture reaches the main engine cylinders.

Construction

Both power and pump pistons are of aluminum, of 3 in. diameter and a stroke of 2½ in. The big ends of the connecting rods are mounted on roller bearings, and are located side by side on one common crank pin.

The cast-iron power cylinder is of the three port type, the crankcase being used to compress the mixture. The cast-iron pump cylinder draws its mixture through a port uncovered by the piston as it reaches the bottom of its stroke, and discharges through a non-return valve in the head.

The crankshaft is in two parts with integral balance weights, and is mounted on ball bearings. From one end the two-cylinder magneto is driven direct, while the fly-wheel and starting gear are carried on the other end.

The starting gear consists of a quadrant attached to the starting lever, which is brought into mesh with the pinion connected through a free wheel to the fly-wheel. When not in use, the quadrant is entirely out of mesh with the pinion.

A cast-iron fan fly-wheel is fitted, with integral blades, which deliver air to the power cylinder at sufficient velocity to enable the engine to be run continuously under full throttle.

The fly-wheel is also provided with a Vee belt rim which may be used for driving auxiliaries. The "petroil" system of lubrication is used (oil mixed with fuel).

Trend of French Cycle Cars and Light Cars

Heavy taxes on cars with piston displacement of more than 67 cu. in. and weighing over 770 pounds has revived interest in cycle cars. Industry tends toward the four-cylinder, water-cooled type, with standard transmission and drive. Description of leading French cycle and light cars.

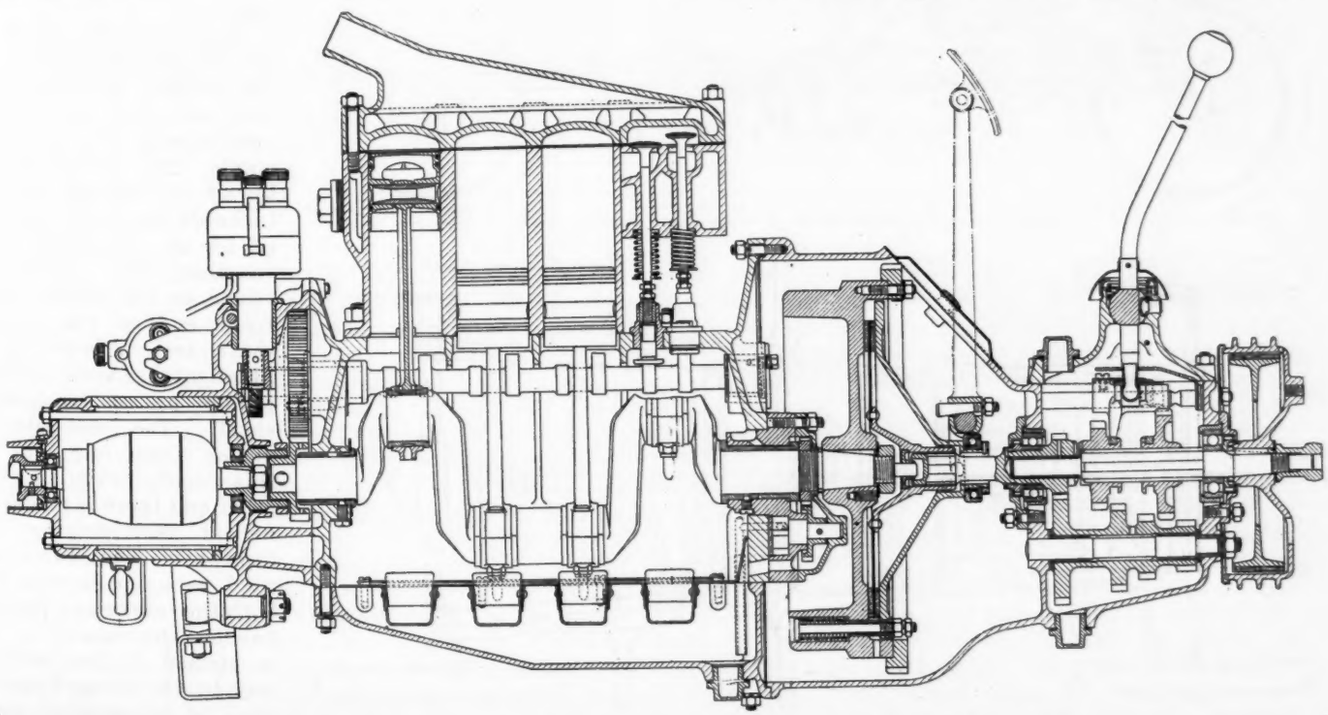
By W. F. Bradley

FRANCE, in common with other European countries, is interested in the development of light two-seater automobiles commonly designed as cycle cars. This term does not imply the adoption of any specific mechanical features, for under the French Government definition any two-seater automobile with a piston displacement not exceeding 67 cu. in. and weighing not more than 770 lb. is a cycle car and entitled to the benefit of the reduced tax of 100 francs per annum. Unless coming within these two limits, the machine is classed as an automobile and pays higher taxes, varying according to district, but certainly not less than 400 francs.

The decision of the Government to give special treatment to 67 cu. in. 770-lb. machines has been responsible for a wonderful revival in cycle car production. French engineers, however, are not showing much interest in pure cycle cars, that is, in light three and four-wheelers having more of the characteristics of the motor cycle than of the automobile. By a pure cycle car is meant a machine with an air-cooled engine with less than four cylinders, a simplified type of change-speed mechanism, and chain or belt drive.

In England considerable importance is being attached to air cooling for small powerplants. In France the tendency is entirely in the opposite direction. Other Continental countries—Italy, Belgium, Austria, Germany—are also showing a preference for water cooling. There is not a single maker of any standing in France who has preferred air-cooled to a water-cooled engine, even when he has to keep his piston displacement down to 67 cu. in. and is limited to a total weight of 770 lb.

The line of thought of the French engineers is that as piston displacement is decreased thermal and mechanical efficiency must be increased. It is an easier task to produce a 67 cu. in. high-speed high-efficiency water-cooled engine than an air-cooled powerplant of the same size. With air cooling the compression must be kept lower to avoid pre-ignition and spark plug troubles. The air-cooled engine will need decarbonizing at more frequent intervals and it will be more difficult to keep in tune. Its oil consumption will be higher, and this is an important matter when a good oil costs at least 5 francs per litre. To obtain good cooling the engine will have to be either a V or horizontal opposed. If four cylinders are adopted, there must



Sectional view of Citroen 5-hp. power plant. Cylinder dimensions, 2.2 by 3.5-in.

be some system of blower to direct a draft of air on the cylinder heads; this absorbs considerable power and complicates the design. While a twin-cylinder air-cooled engine with a simplified type of transmission is attractive from a cheap production point of view, the French industry is pinning its faith on a more elaborate design comprising a four-cylinder water-cooled engine and car type of transmission and drive.

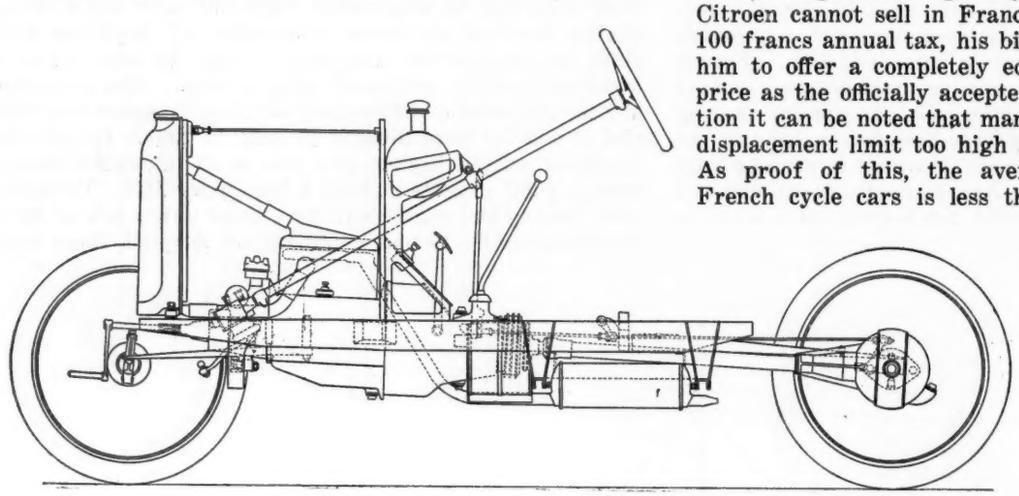
The 67 cu. in. machine has attracted the attention of several important French makers. The most notable example is Citroen, who recently purchased the big Clement Bayard factory in which to produce his four-cylinder 52 cu. in. two-seater light car. This machine, although coming well within the piston displacement limit, is not officially recognized as a cycle car, for it exceeds the 770 lb. weight limit. Nevertheless it comes in direct commercial competition with the pure cycle cars. Peugeot also has a small two-seater with a piston displacement of only 41 cu. in. This is a four-cylinder water-cooled model with worm-driven rear axle. Mathis markets a 46 cu. in. cycle car the mechanical features of which are practically identical with those of his larger cars.

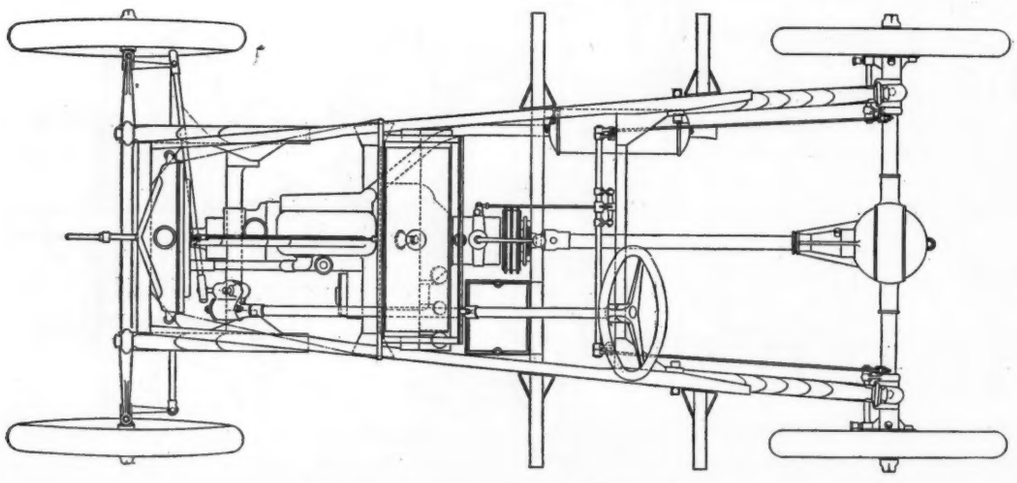
Another important firm interested in this class of machine is the Salmson Aviation Co. Soon after the war this company secured the manufacturing rights, in France, of the English air-cooled G.N. cycle car. This is still built, but the firm is just about to go into production on a 66 cu. in. four-cylinder, water-cooled, shaft-drive model which almost certainly will drive out the firm's air-cooled chain-driven car.

There are no standard dimensions for French cycle cars and light cars. Track varies from 40 to 43 in., and wheelbase is from 86 to 100 in. Wheels are nearly always wire, with 650 by 65 mm. tires (25 by 2½ in.). To get accommodation for two persons, the seats are nearly always staggered. To keep the selling price as low as possible, these machines are generally sold without electric lighting and starting. Some of them are designed to take a starter and lighting set as extras, while a minority have these as standard equipment. Owing to the weight limit of 770 lb. it is difficult to include electric lighting and starting with the machine. If this is added later, thus making the machine overweight, the manufacturer is not responsible if the tax collector takes action.

Citroen's 52 cu. in. light car has the same general features of design as his 10-hp. car. The four-cylinder engine measures 2.2 by 3.5 in. and has a detachable head, an aluminum crankcase and a 1.6 inch crankshaft with two bearings of 1.7 and 2.3 in. length. One of the features in which it differs from the bigger car is in the adoption of Delco lighting and starting. The Delco distributor is driven by helical gears off the camshaft and is carried just ahead of the forward cylinder. The generator is driven from the front end of the crankshaft. The car has a unit powerplant with three speeds and reverse, final drive being by Citroen herringbone gears. A differential is used, Citroen's experiments having shown that an axle without one is unsatisfactory. Rear suspension is by quarter elliptics.

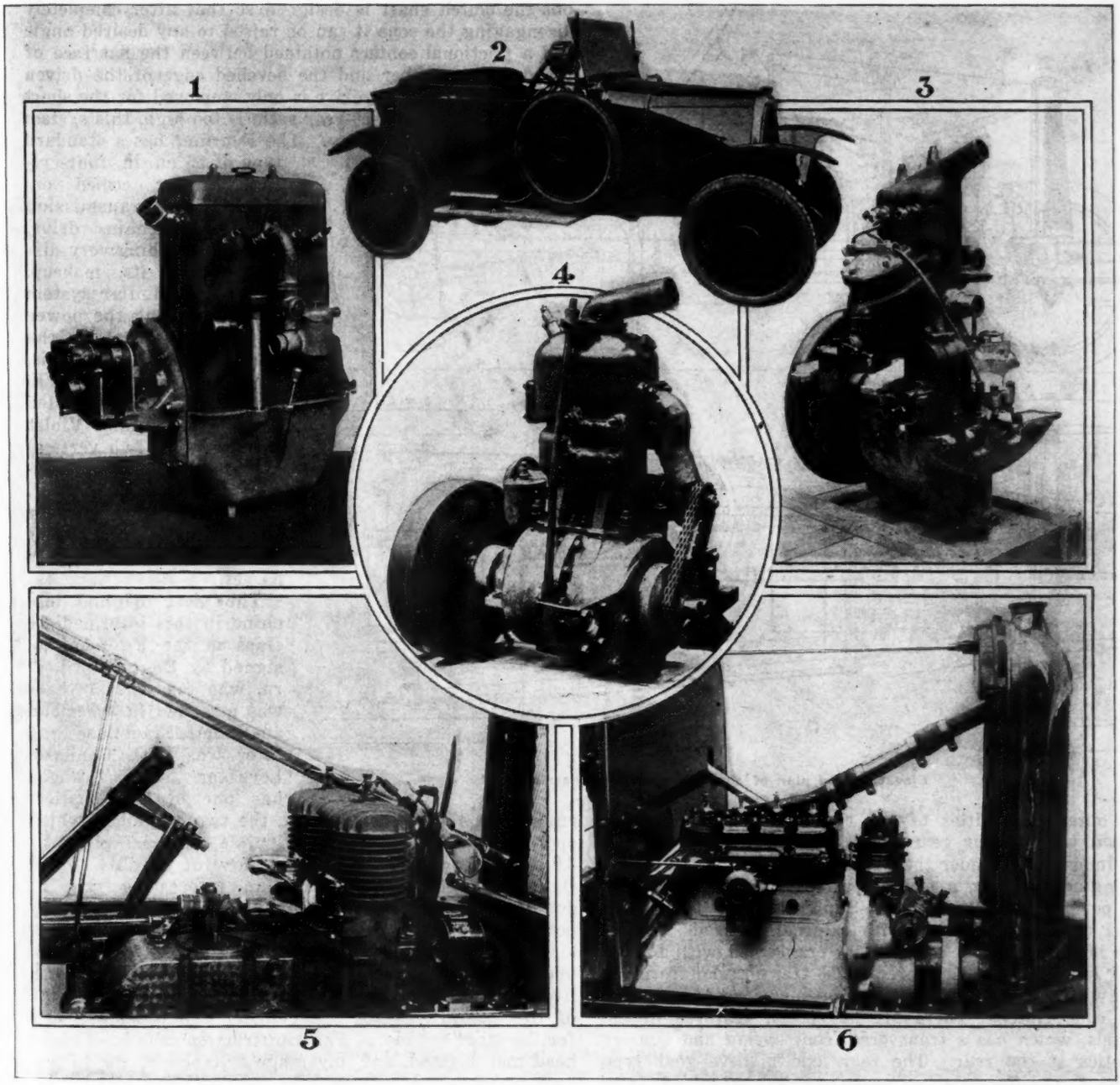
It would appear that Citroen's first idea was to get into the official cycle car class, but the decision, taken after long experiments, to make use of a differential, and to supply electric lighting and starting as standard equipment, brought the weight beyond the official figure. While Citroen cannot sell in France with the advantage of the 100 francs annual tax, his big means of production enable him to offer a completely equipped machine at the same price as the officially accepted cycle cars. In this connection it can be noted that many makers consider the piston displacement limit too high and the weight limit too low. As proof of this, the average piston displacement of French cycle cars is less than 60 cu. in., while all the makers have difficulty in getting inside the weight limit.





Elevation and plan of Citroen 5-hp. chassis

Overhead valve engines are found plentifully in the modern French light cars and cycle cars. The new Salmson is a good example. The cylinders, 2.4 by 3.5 in., are of the detachable head type mounted on an aluminum base chamber, with valves inclined in the head. The front end of the crankshaft carries a helical gear which meshes with another pinion on a transverse shaft. The magneto is driven from one end of this shaft, while at the other end there is a second helical gear driving the camshaft. Four cams are used, each one serving for both the intake and the exhaust. The exhaust valve is opened in the normal way by the upward movement of an external push rod operating an overhead



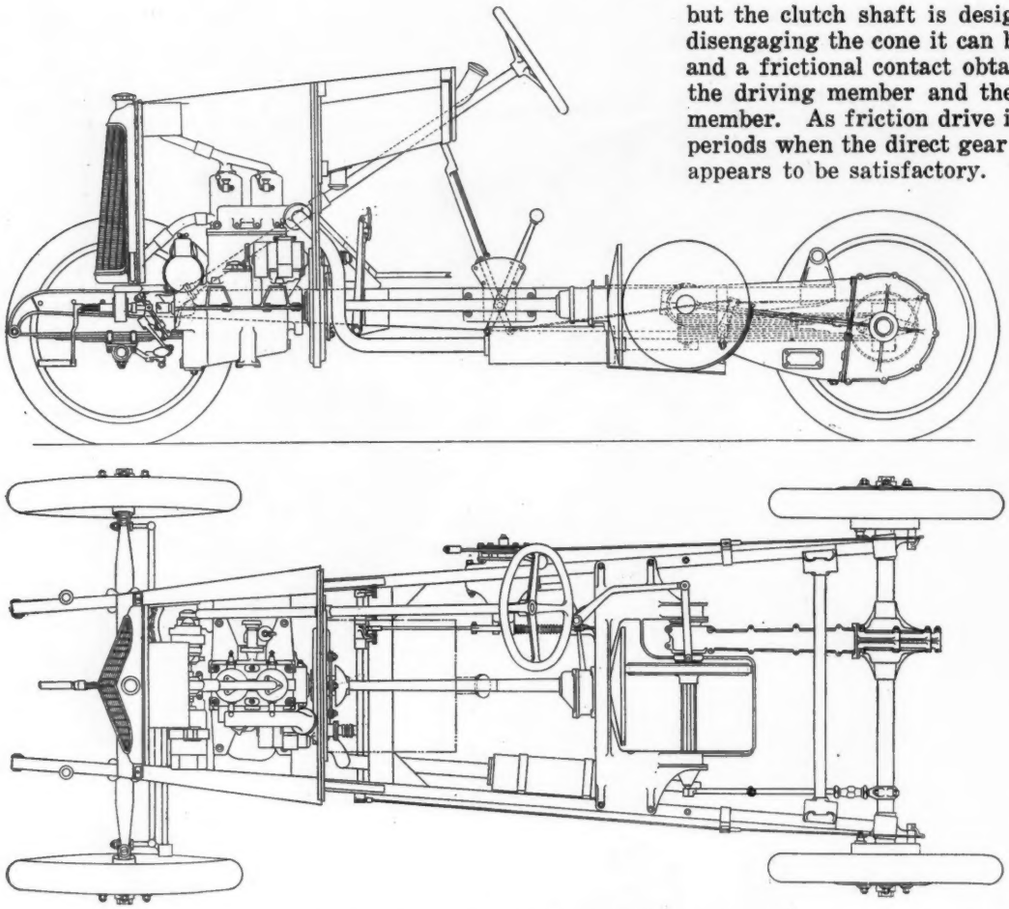
1—M. A. S. E. overhead valve engine. 2—Francon two-seater with two-stroke engine and friction drive. 3—Francon two-cylinder two-stroke engine showing compressor. 4—Two stroke engine of Monroe friction drive cycle car. 5—Twin-cylinder two-stroke engine used on Bleriot cycle car. 6.—Citroen 5-hp. power plant

rocker arm. The intake valve is opened by the action of two coil springs having their extremities attached to the rocker arm and cylinder head respectively. Only the inertia of the valves has to be overcome for closing, and as the weight of each valve is only 1.7 ounces, the engine can run at a high number of revolutions. The plugs are mounted in the head of the combustion chamber, and the whole of this overhead mechanism is inclosed by an aluminum cover.

The transmission is a three-speed type, forming a unit with the engine, but with an open well for the flywheel and the cone clutch. Standard lines of construction are followed in the rear axle, with the exception that no differential is used. In addition to saving weight on the axle itself, this simplifies the brakes, which are of the internal expanding type on the wheel drums, one being operated by hand and the other by foot. In addition to being used on its own chassis, the Salmson powerplant has been adopted by two other French manufacturers, Bignan and Sigma.

Engineer Cauzan, a French specialist in high-efficiency engines, is responsible for the powerplant of the M.A.S.E. cycle car. This is an overhead-valve engine with cylinders and upper half of crankcase in one casting. The push rods go through the cylinder casting and operate the vertical valves by means of rockers. The plugs are inclined just below the valves and the magneto is driven off the end of the camshaft. This 67 cu. in. engine weighs 127 lb. complete and develops 25 hp. maximum.

The M.A.S.E. chassis, built under Le Grain license, has a selective three-speed gearbox. Final drive is by inclosed propeller shaft with fabric universal joint at the front and bevel gearing rear axle without a differential. Cantilever springs are used at the rear. A couple of transverse springs, mounted one above the other, with a central bridge piece between them, fill the functions of the front axle, the steering pivots being carried between



Elevation and plan of Francon cycle car chassis

the outer extremities of the two springs. Steering is direct, with a spur gear reduction contained in a housing immediately under the wheel.

Engineer Picker, a motor specialist, is responsible for the powerplant of the Hinstin-Sup cycle car. This is another overhead-valve job, with external pushrods, detachable head and two-bearing hollow crankshaft with forced-feed lubrication. The three-speed transmission forms a unit with the engine, but with an open well for the flywheel and cone clutch. There are no special features in the chassis, which has a transverse front spring and quarter elliptics at the rear. The rear axle is bevel-gear type without a differential. The horsepower obtained from this engine is stated to be 22, and as the weight of the chassis is 573 lb., there is sufficient margin for a comfortable two-seater body without exceeding the official limit of 770 lb. With this high power and low weight a very snappy car is obtained having a maximum speed well over 50 m.p.h.

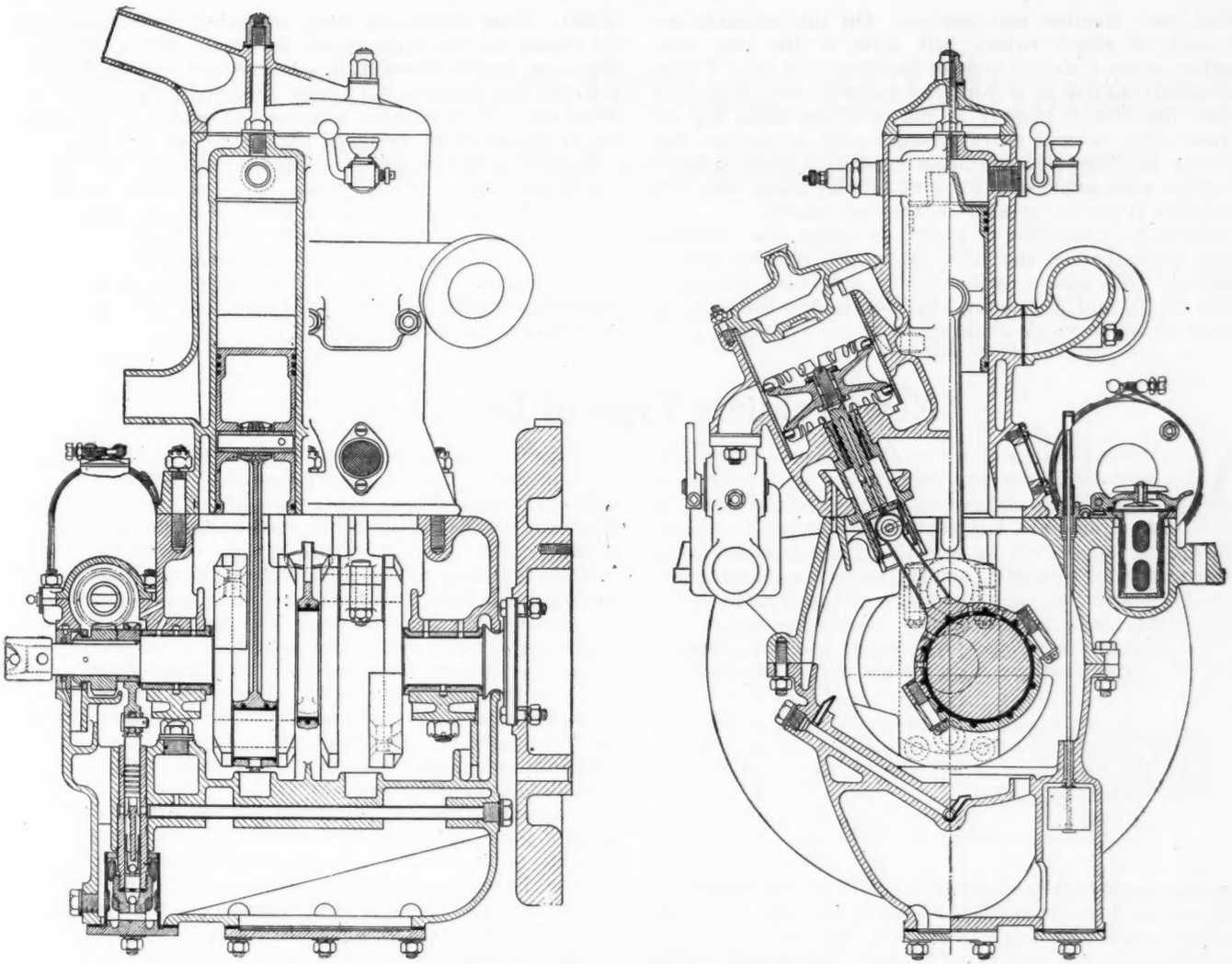
Another successful machine is the Amilcar, built entirely on standard lines, with a 55 cu. in. water-cooled engine having valves on one side and a detachable head. The E.H.P. and Derby are other machines falling into the same standardized type.

In addition to the cycle cars built on what are generally accepted as standardized big car lines, there is an intermediate class of machine having the external appearance of a big car in miniature, but with a simplified type of transmission or drive. One example of this is the Carteret, with a normal type water-cooled L-head engine. The rear-axle housing is of aluminum alloy and contains straight bevel gearing without a differential. On top this car drives straight through from engine to rear axle by a cone clutch and propeller shaft. There is no gear box, but the clutch shaft is designed so that after completely disengaging the cone it can be raised to any desired angle and a frictional contact obtained between the flat face of the driving member and the bevelled edge of the driven member. As friction drive is only employed for the short periods when the direct gear ratio is too high, this system appears to be satisfactory. The Fournier has a standard type of 55 cu. in. four-cylinder water-cooled engine, friction transmission and single-chain drive, without anything very distinctive in its makeup. There is a similar system of transmitting the power to the rear wheels in the Mourre cycle car. This, however, has a special two-stroke water-cooled engine, built under Violet patents, with two vertical cylinders having a common combustion chamber. The engine has been very successful in races, but has not sold very largely as yet.

The most original machine in this intermediate class is the Françon designed by Engineer Chedru, who for several years was attached to American automobile factories and later was with Panhard-Levassor. The Françon has one of the smallest engines on the French market, the two cylinders, which operate on the two-stroke principle, measuring 2.1 by 3.9 in., giving a piston displacement of only 28 cu. in. On this engine Chedru has an interesting type of double-acting compressor and distributor driven by eccentric from the center of the crankshaft. This consists of an aluminum piston with one ring at the top and one at the bottom which compresses the charge and delivers it to the two working cylinders. The upper face of this piston acts for one cylinder and the lower face for the other cylinder. This construction calls for a crosshead and a gland, and advantage is taken of the piston-type crosshead to automatically lubricate the gland. According to official test carried out by the Automobile Club of France, the engine develops 10 hp. at 2000 revolutions, and its oil consumption varies from 10 to 13 oz. per horsepower-hour.

The friction transmission and single-chain drive adopted by Chedru have distinctive features. It has been sought to obtain complete protection and extreme rigidity, and with this object in view the driving and driven members are mounted within a rigid casting forming an aluminum well bolted to the two frame members. Provision is made for locking the driven disk in four positions on its shaft. The driving shaft has a fore-and-aft movement, under the influence of the clutch pedal, and is maintained in contact with the driven member by two coil springs, both of which are in operation for the reverse and two lower ratios, and one only for the two higher ratios. Final drive is by means of a chain contained within an aluminum housing which, in addition to completely protecting the chain, forms a radius member.

Frame members of the Françon are of ash. Semi-elliptic springs are used at the front and a double type of



Two sectional views of Francon two-stroke engine

quarter elliptic at the rear. The main spring consists of six leaves clipped below the frame members and immediately above this a second spring with three leaves having reversed camber. The two springs slide in blocks respectively above and below the axle housing. The lower spring and the main leaf of the upper spring carry all the load, the other leaves of the upper spring acting as a rebound check. The arrangement has proved satisfactory.

Cycle cars on motorcycle lines are not very common in France. In this class the three-wheel Morgan, of English origin, is one of the most popular. For the French market the machine with a twin-cylinder water-cooled engine is much more satisfactory than the corresponding machine with twin air-cooled engine.

Bleriot has a twin-cylinder two-stroke air-cooled engine, with the vertical cylinders set side by side on a com-

French Small Cars

MAKE	No. of Cylinders	Bore and Stroke	Piston Displacement	Valve Location	Cooling	Clutch	No. of Speeds	Transmission	Drive	Suspension	Differential	Wheelbase	Track	Wheels
Amilcar	4	2.1x3.7	55	L	Water	Disk	3	Gear	Bevel	¼ El.	No.	94	43	Wire....700x80
Bedelia	2	3.1x3.9	61	L	Air	None	3	Frict.	Belts	¼ El.	No.	95	40	Wire....650x65
Benjamin	4	2.1x3.2	46	L	Water	Plate	3	Gears	Worm	¼ El.	No.	90	34	Disk....650x65
Bignan	4	2.4x3.5	66	I	Water	Cone	3	Gears	Bevel	¼ El.	No.	102	40	Wire....650x65
Bleriot	2*	2.7x3.7	45		Air	Disk	3	Gears	Belt	¼ El.	No.	79	50	Wire....710x85
Carteret	4	2.2x3.7	59	L	Water	Cone	3	Frict.	Bevel	Cant.	No.	94	43	Wire....700x75
Citroën	4	2.2x3.5	52	L	Water	Plate	3	Gear	Bevel	¼ El.	Yes.	90	44	Disk....650x65
Derby	4	2.2x3.3	55	L	Water	Cone	3	Gear	Bevel	¼ El.	No.	95	43	Wire....700x80
E. H. P.	4	2.1x3.7	55	L	Water	Plate	3	Gear	Bevel	Cant.	No.	90	43	Wire....710x90
Fournier	4	2.1x3.7	55	L	Water	Frict.		Frict.	Chain	¼ El.	No.	90	43	Wire....650x65
Françon	2	2.1x3.9	28		Water	Frict.	4	Frict.	Chain	¼ El.	No.	90	43	Disk....650x65
G. N.	2	3.3x3.8	66	L	Air	Plate	3	Bevel	Chains	¼ El.	No.	95	40	Wire....650x65
Griffon	2*	3.3x3.4	60	L	Air	Disk	2	Gears	Belt	½ El.	No.	86	40	Wire....650x65
Hinstin-Sup	4	2.4x3.5	67	I	Water	Cone	3	Gears	Bevel	¼ El.	No.	96	43	Wire....700x80
Mase	4	1.9x3.8	67	I	Water	Cone	3	Gears	Bevel	Cant.	No.	98	43	Wire....650x65
Mathis	4	2.1x3.1	46	L	Water	Disk	3	Gears	Bevel	½ El.	No.	90	43	Disk....700x80
Morgan	2	3.2x4	64	I	Water	Plate	2	Gears	Chain	¼ El.	No.	80	43	Wire....700x80
Peugeot	4	1.9x3.3	41	L	Water	Disk	3	Gears	Worm	¼ El.	No.	90	36	Wire....650x65
Salmson	4	2.4x3.5	66	I	Water	Cone	3	Gears	Bevel	¼ El.	No.	102	40	Wire....650x65
Sénéchal	4	2.1x3.7	55	L	Water	Plate	3	Gears	Bevel	½ El.	No.	83	40	Wire....650x65
Sigma	4	2.4x3.5	66	I	Water	Cone	3	Gears	Bevel	½ El.	No.	102	40	Wire....650x65

*—Two-stroke engine.

bined base chamber and gearbox. On this machine use is made of single rubber belt drive to the rear axle. Griffon makes a similar type of machine with twin V-type air-cooled engine, a motorcycle gearbox and single-belt drive. Bedelia, a pioneer in the cycle car field, has returned after several years' absence with a machine embodying an air-cooled engine, a system of friction drive from the main shaft of the engine to a lay shaft, and very long belts from the lay shaft to the rear wheels.

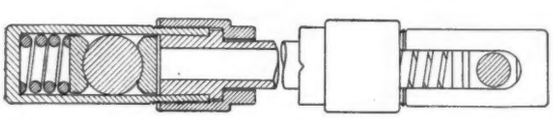
The G. N., a machine of ingenious design, has been the most successful of the pure cycle cars on the French market. This has a twin-cylinder air-cooled engine, a plate clutch and a counter shaft with dog clutches, by means of which single chain drive to the rear axle is obtained. Four chains are used, one being for reverse and the others for the three speeds forward. While this machine has been successful, it is significant that its French makers, the Salmson Co. have thought it necessary to bring out a four-cylinder water-cooled model of the same piston displacement designed throughout on car lines.

Reviewing the situation broadly, the cycle car, as it was known eight or nine years ago, has failed to make good in France. A type of machine which, while officially recognized as a cycle car, but in reality having little or nothing in common with motorcycle development, is proving its worth. These machines are generally diminutive automobiles with all frills removed and all the parts simplified to the lowest degree.

New Weldless Type of Drag Link

AN improved design of a "weldless" type of drag link for automobile steering, brought out by the Smith & Johnson Mfg. Co., is claimed to have a greater factor of safety than drag links now in use. Referring to the accompanying cut, it will be seen that the component parts are the same for both ends, and spring action in both directions is obtained by the positioning of the springs in the sleeve—one inside and the other outside the ball.

The springs are of standard design and furnished to customer's specifications as to weight, etc. The bearings



Detail of weldless type of drag link

are steel stampings made from a hemispherical blank and are pack-hardened to resist the wear of the ball. The lock washers are steel stampings and are heat treated so that the locking tongue will stand at least 8 bendings before breaking.

The sleeves are thimble-shaped steel stampings with the open and externally threaded and a slot in one side wide enough to permit free action of the ball arm. The nuts are steel stampings with one end hexed and the other end formed with 12 serrations to accommodate the tongue of the lock washer and cut with an internal, tapered thread. The connecting tube is of seamless steel tubing, with its ends upset hot and then machined with a back taper. The finished nuts are placed on the tube before the last end is upset.

When this drag link is assembled on the car, the spring, bearings, ball, lock washer and end of tube are inserted in the sleeve from the open end. The nut is then screwed on the sleeve until the end of the sleeve and inner shoulder of the nut are tight against the ring boss of the tube end. As this nut is screwed on it forces the sleeve down against the back tapered end of the tube and rigidly holds the units together. The tongue of the lock washer is then forced into one of the serrations on the end of the nut and locks the nut to the sleeve.

Increased safety is claimed for this design of drag link because there are no welds and no large ball opening in the side of the sleeve. It is easy to assemble on a car because the angle of the ball opening is adjustable and the same drag link can be used for either right or left-hand drive. The link is also adaptable for use as a tie rod, as the short distance from the center of the ball to the end of the sleeve gives clearance for any type of wheel.

This drag link is furnished in four ball sizes of 1, 1⅛, 1¼ and 1½ in. diameter. Grease cup bosses may be specified either on the side or the end of the sleeve, and where adjustment for length between centers of balls is required a special nut is used on one end of the drag link.

New Denby Truck Model

THE Denby Motor Truck Co. recently started production on a new 2½ to 3-ton chassis mounted on 155-in. wheelbase. The new chassis incorporates the Continental C-2, four-cylinder, unit power plant, with 4⅛ by 5¼ in. cylinder dimensions. The chassis is designed to cover a wide range of purposes and is provided with plenty of room behind the seat. The length of the frame behind the driver's compartment is 144-in. The frame width is 33¼ in. and it is made of pressed steel, 6½-in. deep by 2½-in. wide. The frame is pressed from ¼-in. stock. Allowance for a body weight of 1500 lb. is provided in giving the 3-ton rating. The weight of the chassis is 4500 lb.

This truck is designed to have a speed range up to 25 miles per hr. on pneumatics and 18 miles per hr. on solid. The engine develops 39 hp. at normal speeds. Ignition is by magneto, cooling by centrifugal pump and lubrication by combined pump and splash system. The clutch is a Fuller, multiple disk, dry plate type lined with Raybestos. The gearset provides four forward speeds and one reverse and the rear axle is a Clark, model 2-D internal gear type providing an 8 to 1 reduction. The Hotchkiss drive system is utilized. The service brakes are on the propeller shaft, the brake drum being 8½-in. in diameter by 4-in. in width. The hand or emergency brake is an external contracting type on the rear axle. The front springs are 44 by 2¼ and the rear, 52 by 3½. The wheels are steel and the tires either pneumatic 36 by 6, front and 42 by 9 in. rear, or solid, 36 by 4-in., front and 36 by 7-in., rear. The regular equipment includes solid tires, oil lights, hand horn, bumper, towing hooks and tools and sells for $2795 f. o. b. Detroit.

ON Jan. 1, 1921, the public transport services in Paris and suburbs was taken over by the Department of the Seine, which transferred them to a new company. During the first ten months of working under the new management the motor omnibuses conveyed 200,000,000 passengers against 135,000,000 in the corresponding period of the previous year. The receipts increased from 40,000,000 francs to 67,000,000 francs.

Design and Functioning of Laminated Automobile Suspension Springs

Part II

The writer deals with the different spring steels and the various component parts. In concluding he gives specifications for a standard testing procedure for testing raw spring material and the finished product.

By A. A. Remington*

TO insure maximum economy of material in a spring, it is necessary that the maximum stress of which the material is capable shall be carried by every section, or, in other words, that no one section shall be stressed more severely than any other section, so that the mean fiber stress shall be the maximum fiber stress. We have seen that this is attained by the basic rhombus, and therefore theoretically by a laminated spring strictly obeying what may be termed the "rhombus law."

Springs so designed are, however, not generally used in automobile work, but in adopting modifications it is desirable that they shall affect the stress distribution as little as possible, as every divergence between maximum and mean fiber stress involves using more spring steel for a given performance, resulting in greater weight and cost, a lowered efficiency and less reliability for the same mean fiber stress.

Any deviation in a spring from strict conformity to the "rhombus law" increases the stress at certain points and decreases it at others, and while the load-carrying capacity of the spring as represented by a certain amount of deflection under a certain load may not be affected, the modification in stress distribution may so increase the stress at certain points as to seriously reduce the safe maximum load that can be sustained by the spring.

Grading

In order to produce springs which will possess the ability to rebound past their "no-load" position without separation of the leaves, it is usual to provide "nip" by giving an increased camber to each successive blade. If the blades are all of the same thickness, this results in an increased stress in each successive blade, as when the spring is "nipped" up, the stress in some blades is negative, the negative and positive stresses balancing each other to produce equilibrium, as shown in Fig. 15 already referred to. When, therefore, such a spring is loaded externally, the load produces stress, which must be added to the initial stress, thereby producing a greater stress in the more highly cambered blades.

This cause of irregularity in the stress distribution can be minimized but not eliminated by grading the thickness of the blades. The stress in a blade varies with the thickness, so that increased camber and with it "nip" can be embodied with successively thinner blades without increase of stress, and this is frequently done in the lighter classes of automobile springs in which rebound past "no-load" position is assumed to be more likely to occur.

*Paper presented to the Institution of Automobile Engineers. Slightly condensed.

Owing to the variation in blade thickness adopted, the grading is seldom proportionate to the amount of "nip," so that the thicker blades are usually unduly stressed, and in the author's opinion it is preferable to keep all the blades of uniform thickness and the "nip" to the minimum practical amount, and have in consequence a somewhat higher stress in the shorter blades and a lower stress in the longer blades than the mean calculated figure.

The way in which "nip" tends to interact with grading in maintaining greater uniformity of stress is illustrated in Fig. 16, where the stress/strain curves for two hypothetical cases are superimposed, showing that whatever proportions are adopted, while the stresses in blades of varying thickness may be made more nearly uniform by providing a certain amount of "nip," they will only be identical at one deflection, *i. e.*, where the lines cross in the diagram, which is shown for a two-blade spring with one blade twice as stiff as the other.

Stiffness

The stiffness of a spring is its resistance to deflection, and primarily depends on the modulus of elasticity of the material. The basic formula for deflection in convenient

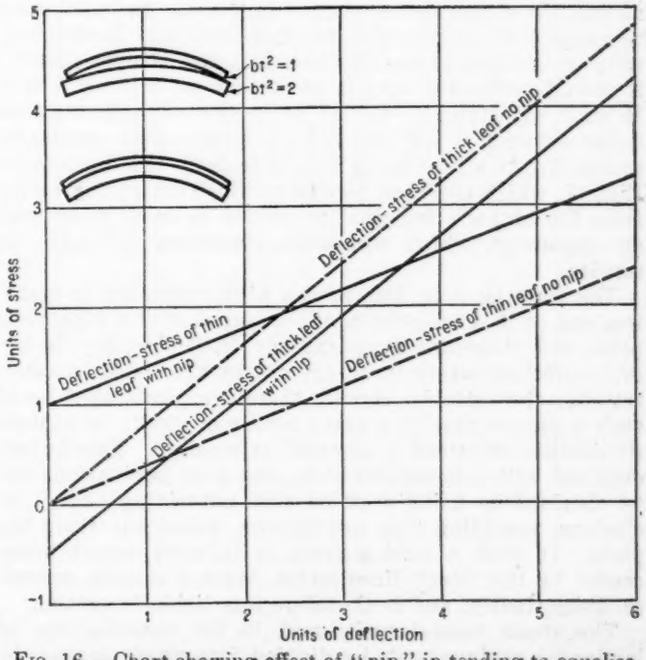


FIG. 16.—Chart showing effect of "nip" in tending to equalise stress in blades of different thicknesses.

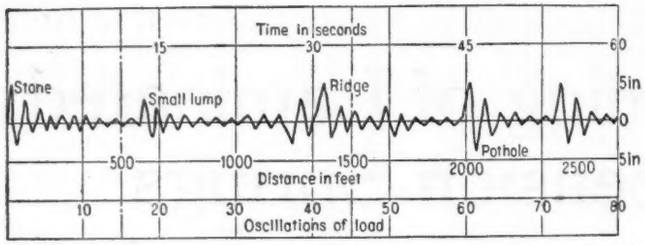


FIG. 17.—Imaginary graph of the movements of a spring of a vehicle travelling at 30 m.p.h. on an ordinary road. Period = 80 per min. = 1 complete swing per 0·75 sec. or per 33 ft.

form for laminated spring calculation has already been given, namely:

$$d = (WL^3)/(4bEnt^3).$$

It is found in practice that this formula requires adjustment, and it is convenient to make the adjustment in the value of E, which, instead of 27.5×10^6, the mean value for the steel, is found to vary for actual springs according to details of construction from about 18×10^6 to about 25×10^6, the low value being due principally to the difference between the nominal and the actual dimensions of the section and to variations in blade lengths and thickness. Quite small variations in blade thickness affect the deflection considerably, as deflection varies as t^3. In calculating deflection in the absence of exact information, it is advisable to adopt a mean figure, say, 22.5×10^6, in conjunction with the nominal blade thickness, and a table of the values of nt^3 for the usual blade thicknesses adopted is given in Appendix I.

This table is equally useful for a graded spring, as the value nt^3 is the sum of the nt^3 values for the separate blades of which the spring is composed, for example:

2—½ in. blades	$\ldots 2t^3 = 0.250$
3—7/16 in. blades	$\ldots 3t^3 = 0.252$
4—⅜ in. blades	$\ldots 4t^3 = 0.212$
	$nt^3 = 0.714$

Material

Many different compositions of steel have been used for automobile suspension springs. In use, the material must be capable of considerable bending in a part having reasonably uniform stress distribution, and if over-stressed it should preferably take a permanent set and not break. It must withstand an almost unlimited number of stress cycles between a low and a high stress, with occasional reversals, the stress being deducible from the diagram in Fig. 17, which has been plotted to illustrate spring action from the author's imagination guided by tests made with an apparatus which measured maximum deflection in service.

The material must also have a high resistance to cracking, and as it is essential to use material with a high yield point and therefore comparatively little ductility to obtain sufficient elastic bending, cracks are liable to cause trouble; the material should, therefore, preferably be of such a nature that if a crack occurs or exists in a blade its liability to extend is as small as possible. This is best obtained with a laminated plate, and such laminations can be obtained by using a rolled steel containing "slag" inclusions, providing they are suitably rolled out along the plate. In such a steel a crack is to some extent intercepted by the "slag" lines which cause a certain amount of discontinuity, and is therefore less liable to extend.

The steels most largely used in the manufacture of laminated springs may be divided into three groups by compositions:

1. Carbon steels, basic and open hearth, the carbon content ranging between approximately 0.50 and 1.0 per cent.
2. Carbon chromium steels, with or without the addition of a small percentage of silicon or vanadium, the carbon content ranging between approximately 0.45 and 0.6 and the chromium content between 0.50 and 1.50.
3. Silico-manganese steels, having a carbon content ranging between 0.50 and 0.80.

The steels are used in the hardened and tempered condition, being usually hardened in oil and tempered in a lead bath.

The chemical compositions and physical properties of various spring steels are given in Tables III and IV, and a tempering curve for one characteristic steel, showing the effect on the resulting physical properties of tempering at different temperatures, is given in Fig. 18.

The modulus of elasticity of the steel itself is substantially the same for all steels, and a suitable mean value is, as has already been mentioned, 27,500,000 in lb.-in. units. Variations due to inaccuracies in the determination of this value are probably greater than variations due to differences in composition of the steel.

American Spring Steels

The American Society for Testing Materials publishes three specifications for spring steel bars, but only specifies method of manufacture and composition.

These three specifications cover:

Carbon steel in two grades.
Silico-manganese steel in two grades.
Chromium vanadium steel in two grades.

The standard compositions are shown in Table V.

This Society has not published any data in regard to the physical properties of spring steel, but publishes in addition a specification for laminated elliptic springs for automobiles which includes an elaborate testing procedure. This specification provides for a maximum test load of twice the normal load, and specifies that the flexibility shall be measured by determining the height under 75 per cent and 125 per cent normal load and dividing the difference in loads by the difference in heights. This and other provisions in the specification make the testing an unnecessarily complicated procedure.

The provision of an arbitrary test load of twice the normal static load is unnecessarily severe in certain cases, and if insisted on would necessitate the use of a lower working stress than would otherwise be permissible, resulting in such cases in unnecessarily heavy springs.

Test of Material

The usual tensile, Brinell and Izod tests on the standard specimen, as adopted for structural steels, are, with the exception of the Brinell test, not directly useful for spring blades. The Brinell test, although it does not indicate directly any particular property, is a convenient means of checking the accuracy of the heat-treatment and is therefore to be recommended, and spring blades tempered to a suitable Brinell range for the steel employed are more likely to give satisfactory service than those either above or below. If below, the permanent-set point will be reached before sufficient bending has taken place, and if above, the plate is more liable to develop cracks from quenching strains or to have insufficient ductility.

The Brinell range for all steels is much the same, and the useful range for existing steels may be considered to lie between Brinell hardness Nos. 363 and 461. It is well known that the Brinell hardness number gives a very close approximation to the tensile strength when multiplied by

a suitable factor, but that the factor varies with the hardness and condition of the steel. For hardened and tempered spring steels the factor is found to be 0.22, and Table VI has been calculated on that basis.

Unfortunately, no standards at present exist on which to form a basis of comparison or to enable specifications to be prepared for tests that are suitable for spring steels, so that it is usual to depend on the composition, a standard heat-treatment and a hardness check, the remainder of the testing being carried out on the manufactured spring itself. Under these conditions, it is obviously necessary to control the temperatures comparatively closely, and, unfortunately, owing to the methods usually adopted in fitting springs, there is liable to be considerable variation in the maximum temperature reached and in the actual quenching temperature. This results in undesirable variations in micro-structure, which may affect the endurance of the blade and may not be capable of being detected by the Brinell test or in fact by any of the usual physical tests, and may even increase the apparent ductility as measured by elongation percentage in the tensile test.

Tests of Springs

At a first test it is usual to "scrag" a laminated spring cold by loading it rapidly to a test-load greater than its designed static load a number of times in succession. It is then measured for load at standard deflection, which checks its conformity to the drawing and also its rate of deflection. It is then "overloaded" and again tested for load-deflection as a safeguard against permanent set.

These tests have no particular meaning, except that they prove the particular spring as far as load-carrying capacity and freedom from permanent set are concerned, but if some uniformity were exhibited in the ratio between theoretical stress and maximum deflection under the "scrag" they could be made to indicate the quality of the material. If springs are made to identical design in carbon and alloy steels respectively, it is possible to find a load that will produce a permanent set in the carbon steel spring, but which the alloy steel spring will withstand without injury.

Springs can be made to carry out the desired load-deflection to a considerable degree of accuracy, and it is reasonable to expect that a series of springs will be alike within a variation from the specified load of plus or minus 5 per cent at a specified camber.

Blade Ends

It is usual in this country to taper the blade ends in thickness, presumably to obtain the rhomboid characteristics by reducing the blade thickness instead of the blade width. To do this accurately would involve making the open end of each blade as a parabola, a form difficult of accomplishment, and in practice the thinning is usually overdone and necessitates a sudden change of camber if "opening at the ends" is to be avoided. It would seem to be better practice to use full-thickness blades and adopt a "spear" of suitable form for this construction.

Eyes

It is usual, in fact almost universal, practice to use rolled eyes in automobile springs. In the best practice it is not unusual for the blade to be slightly thickened and widened at the eye and for a short distance down the blade as shown in Fig. 19. The thickening reduces the tendency of the end of the main blade to "give," thus reducing the necessity of "full-length" blades to support it, a practice which is liable to result in a disproportionate spring and the consequent use of an unnecessary amount of steel.

After rolling, the eyes should be bored through, and in the best practice a gun-metal bush is pressed in and reamed to size, and the ends of the bush and eye faced down to the normal breadth of the spring, within narrow limits. This enables the shackle and shackle-pin to be made to fine limits, and insures a good tight fit at a point where only too many cars early develop squeaking and rattle.

Center-Bolt

Many schemes have been proposed, and some are in use, to do away with the center-bolt and the consequent weakness which it is supposed to introduce. The center-bolt requires to be made of high-class steel as it must be kept reasonably small, and is depended on in "shear" to keep the blades in position longitudinally as well as in tension to hold against the "nip" until such time as the spring is clipped to the axle or other retaining member.

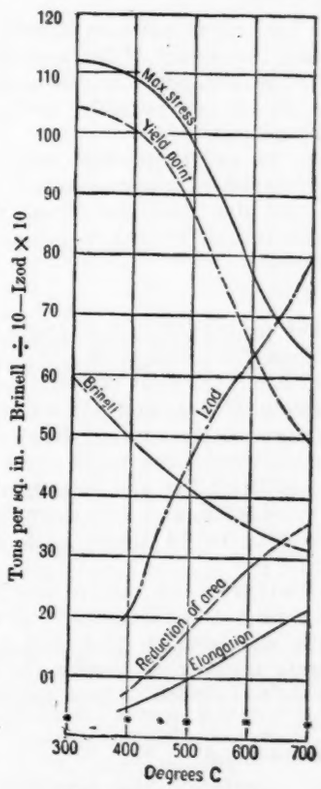
The relations between spring width and center-bolt diameter have been standardized in America.

Clips

It is usual to fit a "slip" near each end of a spring to hold the longer blades in position laterally and also to assist in preventing them from separating on rebound. These "slips" are commonly used in two forms, one involving a rolled eye, and the other rivets through the blade, as shown respectively at *A* and *B* in Fig. 20.

Spears

The more usual forms of "spear" are shown in Fig. 21. The semi-circular, segmental and gothic spears are usually used in conjunction with tapered blades, and the pointed spear with full-thickness blades; in fact, the latter is not



Silico-Manganese Steel.

Carbon	0·76.
Silicon	2·17.
Manganese	0·56.
Sulphur	0·035.
Phosphorus	0·038.

Test bars 1⅛ dia.
Test pieces 0·564 in. × 2 in.
Oil hardened 830°. Water quenched from temperatures indicated.

FIG. 18.—Tempering chart.

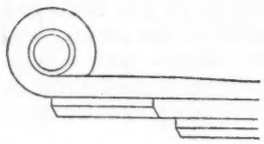


FIG. 19.—Spring end showing thickened eye.

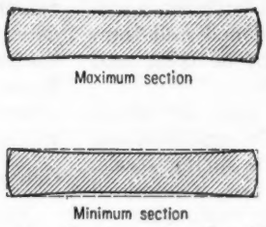


FIG. 22.—Sections of spring blades.

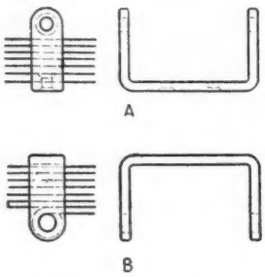


FIG. 20.—Usual forms of spring clip.

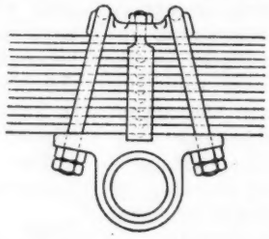


FIG. 23.—Suggested method of mounting a heavy spring.

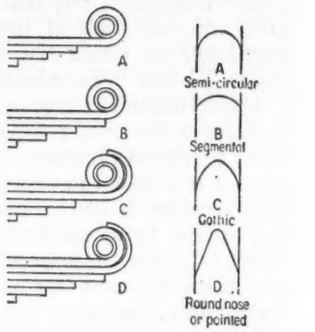


FIG. 21.—Blade ends and spears.

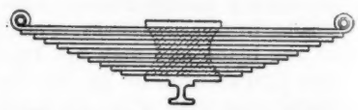


FIG. 24.—Loss due to wide bed.

suitable for tapered blades, and it will be observed that it will conform to the rhombus law if made of suitable proportions, without any thinning of the blade:

Effect of Essential Factors

In considering the best proportions for a spring, the effect of the various factors must be taken into consideration, and the principal of these are:

1. Full-length top blade.
2. "Nip."
3. Grading.

These three factors, as has been shown, affect the stress distribution, and the object of the spring designer should be to balance the antagonistic characteristics so as to maintain the maximum possible uniformity of stress throughout the spring.

The adoption of any proportion that alters the stress distribution necessitates more material in proportion to the ratio between the maximum stress at any point and the mean stress, and so results in a lowering of the safe static mean stress.

Proportions

From current practice it would appear that laminated automobile suspension springs should have not less than five blades and not more than sixteen, and that the width should be between 1½ in. and 4½ in., and be such that the total thickness of the spring should be not less than half nor more than twice the width.

The amount of flexibility and the permissible stress has already been considered, and it is clear that an infinity of springs can be designed to comply with any given specification.

There is little indication that a multiplicity of blades makes better riding, and therefore it is probably best to adopt a length and breadth that will provide a spring with a moderate number of blades and a thickness not much exceeding its breadth as producing the most satisfactory spring.

Deflection Under Load

To ascertain accurately the deflection under load of blades of different lengths and thicknesses, separately and in combination, the author has prepared a series of straight blades of different lengths so as to make up proportionate two-blade, three-blade and four-blade springs, and loaded all the blades, first separately so as to get a load-deflection curve for each blade, and then in combination, so as to obtain the loads and reactions at the blade tips. In this manner it is quite simple to plot a bending-moment diagram for each blade under any load, and to ascertain the degree of compliance with the "rhombus" law and the actual variation in stress in the different blades which results from alterations in relative blade lengths, etc.

A research somewhat on these lines was carried out in America by David Landau,* who found non-compliance with the "rhombus" law and irregularity of stress in non-speared springs with blades of uniform thickness, as might have been expected. The author confirmed Landau's results and established experimentally that springs can be made with uniform stress. At some future date he hopes to extend the research to investigation of the effect of "nip" in combination with grading on the stress distribution, so as to verify on actual spring blades the accuracy of existing theory.

It is probable that general practice in regard to "nip" and "grading" is susceptible of great improvement in the direction of increased uniformity of stress and resulting economy of material by permitting higher mean stresses without any reduction in endurance.

Maximum Test Load

Automobile springs should be designed so that a test load in excess of the normal static load by a definite amount may be applied without overstressing. This test load will vary between 1.75 and three times the normal load for reasons already considered, and should be applied to every spring as a standard test.

Standard Test

A suitable specification for a standard testing procedure, including the foregoing provision, is as follows:

1. *Material.*—The temper of the spring blades shall be verified by the Brinell test.

2. *Scragging.*—All springs shall be "scragged" before load-testing by means of a power "scrag," which shall deflect the spring rapidly not less than four times to an extent not less than its calculated deflection under the test load.

3. *Testing.*—Springs for test shall be mounted for load-test so as to permit free horizontal movement while remaining in the position selected for test.

Cantilever springs, when tested one end at a time, and quarter-elliptic springs shall be clamped to a pressure-block in the form of a stiff beam of sufficient length to maintain the spring in position.

All measurements for height shall be made between the surface of the pressure-block and a line joining the centers

*See Journal of the Franklin Institute, April, 1918.

of the eyes, or, in a quarter-elliptic spring, between the centers of the eye and the pressure-block measured at right angles to the surface of the block.

The clamping of springs for test shall provide sufficient rigidity for accurate measurement of deflection.

When measuring the deflection of a spring, the load shall be applied gradually and in such a way that the required load shall not be exceeded.

4. *Test Load.*—The specified test load shall be applied to all springs.

5. *Loaded Height.*—The loaded height shall be the height measured when the normal load is applied after scragging.

6. *Permanent Set.*—After the "scrag" test has been applied, and the loaded height has been measured, the maximum test load shall be applied and fully released, and the loaded height again measured, the difference being the permanent set.

7. *Rate of Deflection.*—The rate of deflection shall be determined by measuring the height under normal load and dividing the normal load by the distance deflected from the free position.

8. *Free Height.*—The free height is governed by the rate of deflection.

Accuracy of Dimensions

The bars from which the blades are made are rolled concave on the faces, as shown in Fig. 22, so as to insure a close fit at the edges and to leave space for lubricant. The exact amount of concavity is not important, and to avoid a multiplicity of rolls of different radii it is usual to permit considerable tolerance. The usual practice results in the blade being about 0.012 in. to 0.018 in. thinner in the middle than at the edge, and the total tolerance on thickness permitted is usually about 0.008 in.

Although there is at present no standard, it is best practice to provide the thickness tolerance all on the plus side, to assist in compensating for the loss of section due to concave rolling as shown in Fig. 22, where the nominal size is shown in dotted lines.

To ascertain the accuracy to which springs are actually made, the author has analyzed and measured many springs in detail, and a selection of these measurements is given in Appendix II.

Fixing

The fixing of a spring on an axle is an important matter. In the case of heavy springs with many blades, a wide bed renders a considerable portion of the center of the spring inoperative, and therefore wastes a considerable amount of spring steel. It is, however, necessary to have a fairly wide bed, especially when there is a center bolt, as the bending moment must not be permitted to come on the blades at the center where they are weakened by the hole.

A method of fixing which provides a wide bed and yet renders most of the center portion of the spring operative is shown in Fig. 23. The clips, it will be observed, are placed on an angle and are made of a form which avoids weakening them by bending them over sharp corners. A scheme that is in general use for avoidance of the center bolt is also shown, and the author believes this to be the best way of fixing heavy springs.

Where a wide bed and equally wide top plate are used, the spring becomes, in effect, two half-cantilever springs of a length somewhat greater than the unclipped length, as shown in Fig. 24, and the advantage in the direction of weight-saving by utilizing more of the spring as is the case with fixings of the type shown in Fig. 23 is obvious. In the case of small springs which are comparatively thin and which can consequently be used with comparatively narrow beds, the same difficulties do not arise, and the loss of effective spring steel is, of course, proportionately less.

In connection with spring fixings, it is advisable to avoid a sharp edge across which the spring has to bend, in fact, a considerable radius is preferable. The use of soft packing, either above or below the spring, is to be deprecated, and the rounding of the bed and clip plate is a preferable expedient and minimizes any tendency for the clips to work loose. It is, of course, imperative that the clips shall always be tight, as in most designs it is the friction between the spring and the axle that is depended upon to keep the two parts in their correct relative positions. Although the center bolt head may be recessed, this can only be considered a location, and should not be depended on to take load.

Appendix I

FORMULÆ AND TABLES FOR CALCULATING SEMI-ELLIPTIC SPRINGS

$$d = \frac{WL^3}{4bEnt^3}$$

$$f = 1.5\,\frac{WL}{bnt^2}$$

$$f = \frac{6Etd}{L^2}$$

$$W = \frac{4bEdnt^3}{L^3}$$

$$E = \frac{WL^3}{4bdnt^3}$$

$$T = \pi\sqrt{\frac{d}{12g}}$$

$$= \pi\sqrt{\frac{WL^3}{4bEnt^3}}\ 12g$$

$$P = \sqrt{\frac{35{,}230}{d}}$$

$$nt^2 = \frac{1.5\,WL}{bf}$$

$$nt^3 = \frac{WL^3}{4bEd}$$

W = load in lb.
L = length in in.
E = modulus of elasticity (modified value) in lb. per sq. in.
P = rate of oscillation (number of complete oscillations per minute).
T = time of one complete oscillation in seconds.
f = stress in lb. per sq. in. (as given by the beam formula).
b = breadth of blade in in.
n = number of blades.
t = thickness of blade in in.
d = deflection in in.
g = acceleration due to gravity in ft. per sec. per sec. (32.2).

Appendix II

INVESTIGATION OF ONE REPRESENTATIVE FRONT AND ONE REPRESENTATIVE REAR SEMI-ELLIPTIC SPRING TAKEN AT RANDOM FROM A BATCH DELIVERED BY THE MAKERS

Characteristics

	Front	Rear
Loaded length.....	37 in.	52 in.
Width	2 in.	2 in.
Leaf number.....	8	9
Leaf thickness.....	1⅜ in.	2$\frac{5}{16}$ in.
Leaf thickness.....	1$\frac{5}{16}$ in.	3$\frac{3}{32}$ in.
Leaf thickness.....	2$\frac{3}{32}$ in.	4¼ in.
Leaf thickness.....	4¼ in.	.....
Total thickness....	2$\frac{3}{16}$ in.	2½ in.
Static load.....	900 lb.	1200 lb.
Loaded height.....	2¾ in.	2⅛ in.
Free height.....	4⅛ in.	7¾ in.

Chemical Composition and Mechanical Properties of Main Leaves

	Front	Rear
Carbon	0.60	0.64
Silicon	0.32	0.25
Manganese	0.54	0.54
Sulphur	0.019	0.025
Phosphorus	0.022	0.023
Chromium	0.51	0.56
Maximum stress, tons per sq. in.	85	86
Yield point, tons per sq. in.	80	83
Elongation, per cent.	8.5	8.0
Reduction of area, per cent	27	24
Brinell number	372–388	388–415
Izod ft.-lb.	14–16	12–14

Brinell Hardness Number of Leaves (tested at the centre of length)

Blade	Front	Rear
1	372	388
2	363	388
3	388	388
4	388	388
5	363	388
6	363	363
7	415	352
8	388	363
9	—	388

Deflection Test on Portions Cut from Leaves

Load,	Front 12×2×0.295			Front 12×2×0.270			Rear 12×1.995×0.298			Rear 12×1.985×0.260		
Lb.	D	P	f	D	P	f	D	P	f	D	P	f
10	0	0	.....	0	0	.....	0	0	.....	0	0	.....
100	25	0	10,300	44	0	12,300	25	0	10,100	44	0	13,400
500	130	0	51,700	186	0	61,700	135	0	50,800	209	0	67,100
1,000	278	0	103,500	374	0	124,000	258	0	102,000	414	4	134,000
1,200	336	0	124,200	449	2	150,000	315	2	122,000	510	10	161,000
1,400	393	0	145,000	526	7	173,000	373	4	142,000	608	26	188,000
1,600	452	2	166,000	605	14	198,000	437	10	162,000	...	..	.....
1,800	512	3	186,000	685	30	223,000	...	..	.....	...	..	.....
2,000	575	7	207,000	...	..	.....	...	..	.....	...	..	.....

D = deflection in thousandths of an inch. *P* = permanent set in thousandths of an inch. *f* = calculated stress in lb. per sq. in.

Deflection Test on the Complete Spring

Deflection in in.	Front Load in lb.	Front Loaded Length in in.	Front Permanent Set in in.	Rear Load in lb.	Rear Loaded Length in in.	Rear Permanent Set in in.
1	714	37.0	0	330	51.5	0
2	1,444	37.2	0	510	52.5	0
3	2,098	37.3	0	785	53.1	0
4	2,840	37.0	0	1,013	53.5	0
5	3,578	36.8	0	1,195	54.0	0
6	4,372	36.3	0	1,405	54.2	0
7*	5,124	35.8	0.25	1,610	54.3	0
8	....	...	..	1,808	54.4	0
9	....	...	..	2,014	54.4	0
10	....	...	..	2,214	54.2	0
11†	....	...	..	2,590	54.1	0.25

*Equivalent to 3⅞ in. reverse camber on front spring.
†Equivalent to 3¼ in. reverse camber on rear spring.

Periodicity Test on Complete Springs

Load, lb.	Complete Oscillations Per Minute Front Spring	Rear Spring
200	160†	140
400	160	116
600	136	92
800	112	76
1,000	92	68
1,200	..	64

†Doubtful as regards accuracy. Result is probably too low as a regular swing is difficult to maintain.

Modulus of Elasticity of Steel Calculated from Deflection Tests

Leaf Dimensions, in.	Modulus, lb. per sq. in.
12 × 2.000 × 0.295	28,750,000
12 × 2.000 × 0.270	29,250,000
12 × 1.995 × 0.298	30,850,000
12 × 1.985 × 0.260	30,000,000

Appendix III

AN ANALYSIS OF DIMENSIONS OF A NUMBER OF ACTUAL SEMI-ELLIPTIC SPRINGS TAKEN AT RANDOM FROM CURRENT PRACTICE SHOWING THE MEAN STRESSES ADOPTED

	Loaded Static Load, lb.	Length in.	Width, in.	Number and Thickness of Leaves, in.	Mean Static Stress Per lb. sq. in.
Rear 5-ton truck	7,280	54	3.5	13 1½ 6 7/16 6⅜	75,000
Front 4-ton truck	2,000	42	2.5	8 1 7/16 4⅜ 3 7/16	51,400
Rear 3-ton truck	4,700	54	3.5	11 2½ 4 7/16 5⅜	62,000
Rear 4-ton truck	5,600	54	3.5	9 7/16	75,000
Front 40-hp. car	900	37	2.0	8 1⅜ 1 7/16 2 9/16 4¼	39,000
Rear 40-hp. car	1,200	52	2.0	9 2 5/16 3 13/32 4¼	71,000
Front 12-hp. car	400	34	1.5	5 7/32	56,000
Rear 12-hp. car	600	42	1.5	6 7/32	87,000

The stress shown in the last column is the average static stress due to the static load, assuming equal stress-distribution throughout the spring based on the formula—

$$f = (1.5\,W\,L)/(bnt^2),$$

which includes the value—

$$bt^2/6,$$

and is therefore the stress value obtained by the ordinary beam formula which, as has been shown, may be considerably greater than the actual fiber-stress sustained by the material.

The maximum stress sustained by the spring is that due to the test load, and in normal practice this should be obtained by multiplying the normal static stress by a factor which should vary from 1.75 to 2.25 for rear springs, and from 2.5 to 3.5 for front springs.

A Comprehensive Highway Transport Outline

A COMPREHENSIVE outline of highway transport has been prepared for the Highway and Highway Transport Education Committee.

Although making no pretense of being complete, the outline treats exhaustively of the various phases which make highway transport one of the dominant subjects of the day. It was prepared by Professor Lewis W. McIntyre, Assistant Professor of Civil Engineering, University of Pittsburgh, at the urgent insistence of schools of engineering and economics, highway engineers and highway officials, and is expected to be the forerunner of text books on the subject, to which many of the leading economists and engineers in the country are giving their attention.

This outline may be adapted for classroom exercises and lectures, or it may be used by engineers and business men actively engaged in the manufacture of motor vehicles or the construction of highways.

Subdivided into five divisions, it treats of the field of highway transport, the highway and the motor vehicle, legal phases of the subject, principles of successful operation and the selling of transportation.

The booklet is being distributed by the Highway and Highway Transport Education Committee, from its offices in the Willard Building, Washington, D. C., first to colleges and universities and then upon request to manufacturers and business men.

Function and Operation of the Vibrating Voltage Regulator

The development and characteristics of this type. The writer states that the early causes of failure were either mechanical or due to variations in output and explains the methods used to overcome these difficulties.

By W. P. Loudon*

THE purpose of the vibrating regulator in an automobile lighting system is to maintain the voltage at a nearly constant value regardless of the load or battery conditions. The result of this type of regulation is that charging current is furnished to the battery in inverse proportion to its state of charge, that is, a high current to a discharged battery and a low or practically zero current to one nearly full.

The main object of such a system is, of course, to bring an exhausted battery to its fully charged state in the shortest time, without introducing injurious effects which would shorten the service life of the battery. It is essential that the battery be always nearly fully charged in order to obtain the maximum efficiency from the starting apparatus, the lights, and, in cold weather, to eliminate danger of freezing.

The "Tapering" Charge

Theoretically, in a constant potential system, the battery is charged most efficiently by starting with an initial current flow in amperes equal to the ampere hour rating (5 ampere discharge rate) of the cells — and gradually decreasing this amount in proportion to the state of charge, so that when charging is completed, the current will have dropped to zero. Obviously, this would necessitate units capable of generating and carrying relatively large outputs, and which for the greater part of the time would be operated at far below their normal capacity. Such a course would naturally be not only expensive, but would add considerable excess weight to the car, and would be unjustified, even though sufficient space were available for the installation of the larger units.

As in nearly all engineering problems, it is necessary to effect a compromise. The initial rate is, then, so chosen as to permit the use of normal sized units and at the same time insure the charging of an exhausted battery in from eight to ten hours.

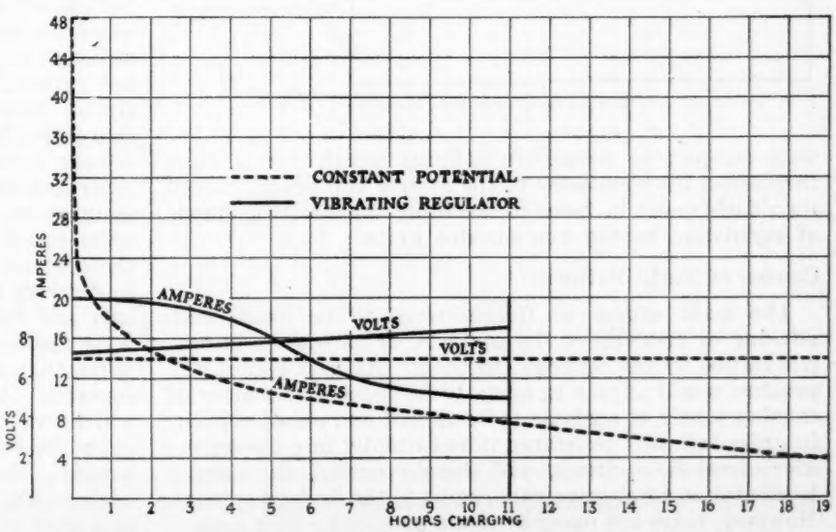
Two Functions of Regulator

The regulator has, in fact, two functions to perform, dependent upon the battery condition. They are in a certain measure different, but at the same time bear a definite relation to each other. For instance, the voltage of a discharged battery is below that for which the regulator system is set. Consequently, the current which will flow in the circuit will be limited only by the voltage drop due to the resistance of the various units. A voltage responsive coil alone would not operate in this case, since the potential of the generator will drop to nearly that of the battery and the contacts will not open. At moderate or high speeds, therefore, the generator voltage would be absorbed in IR drop—the current reaching an excessive value.

To overcome this difficulty, a current responsive (or series) winding of few turns is added so that the regulator contacts will be opened whenever the current tends to increase above a definite value. This winding also acts, in a measure, in the form of a reactance, opposing rapid fluctuations of the current and tending to steady the flow. The regulator under these conditions, therefore, is a current regulating device.

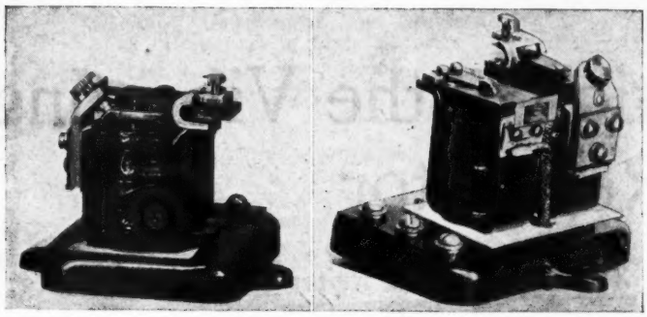
On the other hand, the voltage of a full battery while charging is above that of the regulator system setting, and whenever the contacts are closed, the generator voltage attempts to rise and the voltage responsive windings cause the contacts to open. With open circuit and resistance load conditions the regulator characteristics will follow principally those present with a charged battery, since in the one case the voltage responds and in the second case both current and voltage tend to increase

This compromise does not have such serious faults as might at first appear, but, on the contrary, the situation is improved to a marked degree. The current and voltage responsive means both contribute to a given setting of the regulator with a low battery. On the other hand, in the case of no load (or open circuit) operation, the voltage

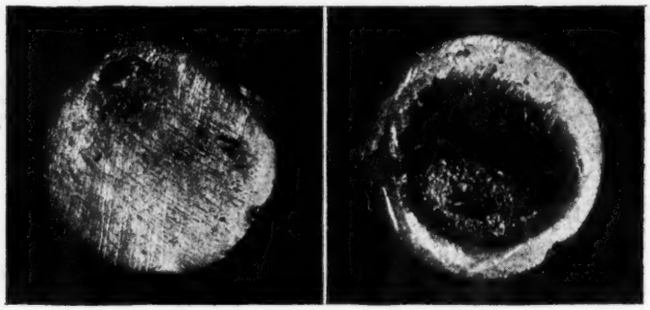


1—Charging curve, comparing vibrating and constant potential regulators

*Engineer, Automotive Engineering Department, Westinghouse Elec. & Mfg. Co.



2—Picture of regulator and cutout.

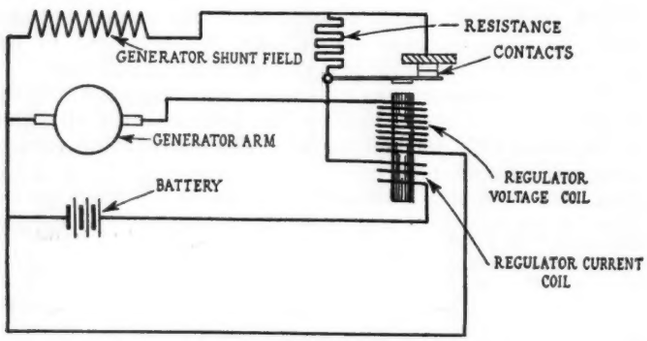


4—Microphotograph of contacts.

must rise slightly to compensate for the loss of the pull formerly contributed by the current winding. In actual battery charging, this combination cuts down the initial current, but raises the final current, since the voltage has also risen slightly. Consequently, the battery is charged at a faster average rate than in the true constant potential system as will be seen by Fig. 1. No harm can come from this method as long as the final rate does not exceed a value of current which a fully charged battery can receive continually without destructive gassing or heating.

The use of vibrating voltage regulators for governing the output of generators is by no means new. They are commonly met in power generating stations for the purpose of keeping constant the line voltage of the generators, regardless of the load being used. Many other types of these regulators will be found serving varied purposes—power factor regulators, load distribution regulators, railway car lighting, etc.

The introduction of the vibrating type regulator to automobile generators, in quantities, dates back to about 1912, and this regulator is still in active use in many systems. Many variations and adaptations of this type have been devised and offered, and considerable ground has been covered in the art. The earlier types of regulators



3—Diagram—elementary regulator.

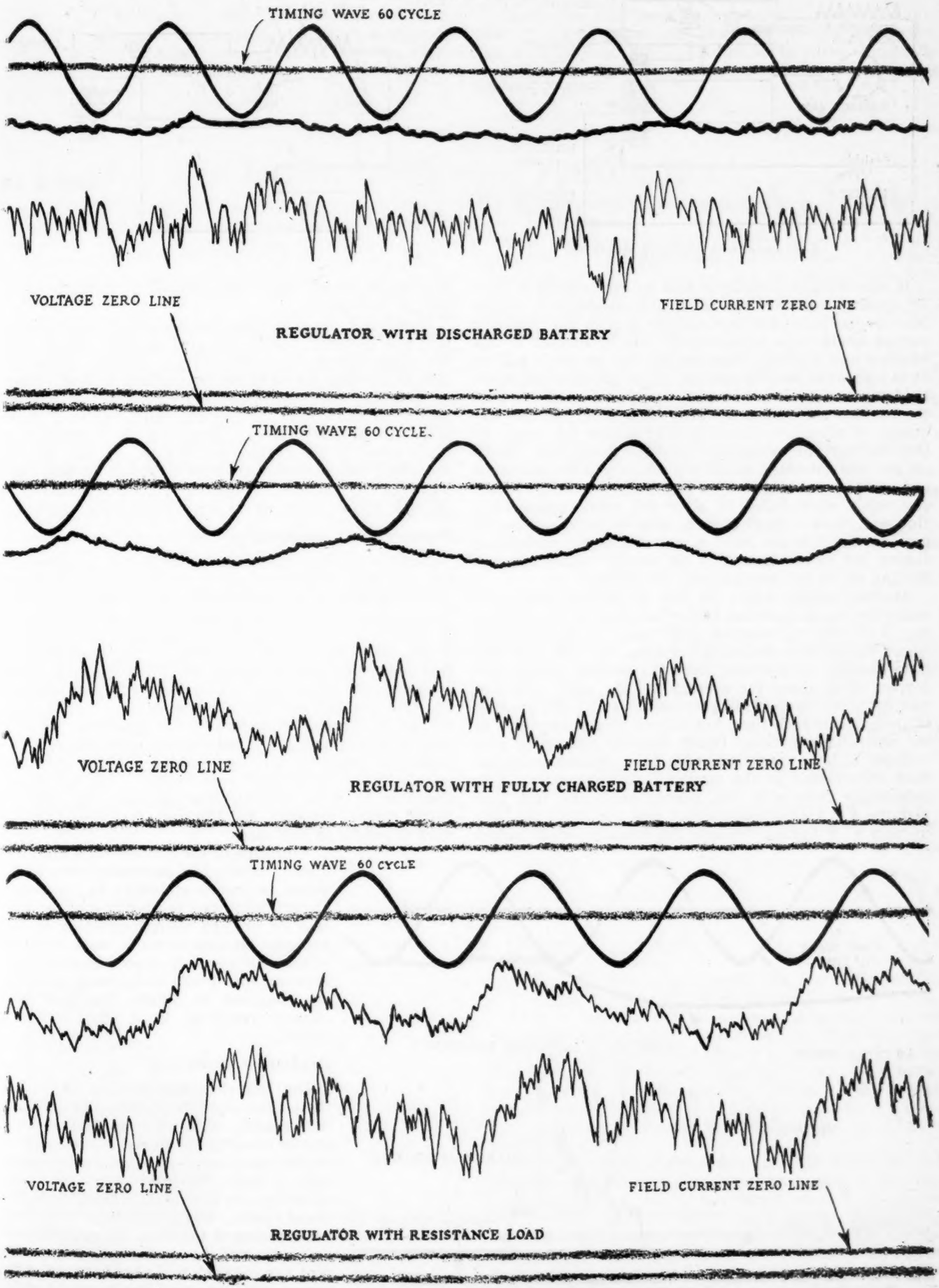
were subject to numerous failures which for a time threatened the popularity of the system and nearly caused its abandonment in favor of the other types with methods of regulation having non-movable parts.

Causes of Early Failures

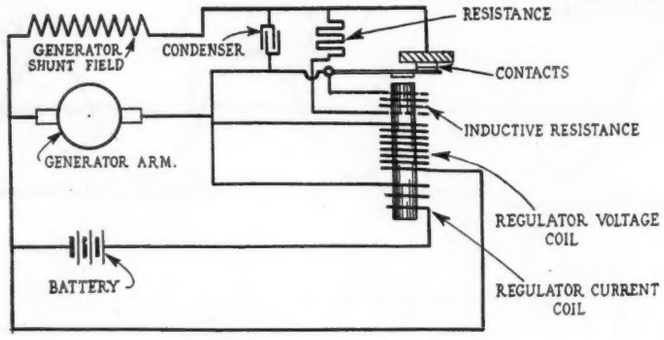
The main causes of failure were either mechanical, sticking or freezing of the contacts, or variations in output caused by the settings changing. At first glance, the problem would appear to many to be the simple matter of causing a pair of contacts to be opened and closed rapidly, in order to insert resistance intermittently into the generator shunt field circuit, and thereby control the output, holding it at an average value equal to the desired amount. However, there are many intricate problems which present themselves in the designing of a successful regulator. Perhaps the most vital and difficult to overcome is the sticking or freezing of the contacts, inasmuch as failure at this point means an excessive rise in output and liability of ruin of both the generator and battery. On the other hand, the attempt to cure the fault should not swing too far in the other direction, and interpose high resistance contact conditions in the field circuit such that the generator cannot deliver its output. The best combination seems to be, as with a shaft and bearing, a relatively hard contact and a soft contact, the hard contact being the movable member. For this purpose tungsten and silver are used, the latter forming the positive contact. A slight rubbing effect should be imparted, and to accomplish this the armature carrying the movable contact is mounted on a very thin leaf form of hinge and the contacts are set at a 45 deg. angle. This gives the desired wipe, not enough to cause grooving, but sufficient to have a cleaning effect and prevent the building up of tips in the silver. The angle also permits the displaced material or oxide powder to be brushed from the contact surfaces. Other combinations of inexpensive contacts have been tried without improvement in the results. Perhaps the only case worthy of special mention were two similar tungsten contacts. These were free from sticking, but after a short time tungsten oxide, which is an insulator, formed on the face of the positive contact and ultimately inserted too great a resistance into the field circuit, interfering with generation.

Condenser in Shunt to Vibrator

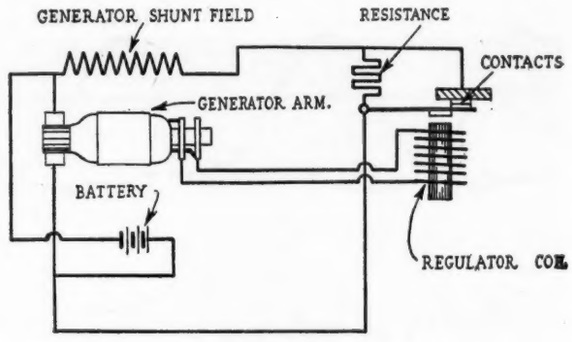
The use of a condenser, with and without series resistance to change its time factor, has been tried (and in some cases with apparent success) for the elimination of the arc which is drawn each time as the contacts are opened. A peculiar observation in this connection is that in many instances contacts will stick with great persistency even when no arc is discernible, while in other cases a destructive arc may be present and the contacts never stick, but rather fail from being consumed by the arc. It was almost invariably noticed that the sticking occurs in charging a low battery; *i.e.*, in the case where the battery voltage is below the system voltage and the regulator is controlled by the current winding only. This leads to the assumption that in such cases the generator voltage collapse, on the opening of the contacts, is so rapid that the contacts are in reality not opened except sufficiently to draw an arc and maintain it, until the metal is volatilized and finally fuses. In order to overcome this point, it is therefore necessary to so proportion the regulator parts that a very strong pull is always exerted on the contacts. As a further proof of this point, a regulator which ran successfully for 1800 hours on a resistance load failed in three minutes when connected to a discharged battery. In the resistance load charging, the voltage varied sufficiently to permit the contacts to actually open and close so as to disrupt the arc, and no difficulty was encountered.



7—Oscillogram of straight regulator.



5—Diagram with inductive resistance.



6—Diagram with A. C. tap.

It was thought possible at first to overcome this point by winding a part of the resistance cumulatively around the core, so that when the contacts parted, the inductive voltage would cause a momentary rush of current in this winding and increase, temporarily, the magnetic pull so as to insure the positive opening of the contacts and thereby damp out the arm. In fact, the idea worked too well, the contacts were opened widely each time, but the frequency of vibration was reduced to a very low order, so that the current variations were too great, and, lastly, an arc was produced each time which rapidly consumed the contacts. Variations of condenser capacity within reasonable sizes failed to alter the spark appreciably. However, failure from sticking was entirely eliminated, proving that the arc itself is not always the controlling factor, but rather that it is the steady maintenance or floating of the arc which causes the damage.

Another method, which has been previously tried, is to excite the regulator shunt field with either A.C. or pulsating D.C. current, obtained from taps on the armature whose voltage it is desired to regulate. The effect of this is to hammer the contacts, since the exciting voltage and current rises above the average voltage each cycle and also drops to zero. This positively insures the opening of the contacts each time, but introduces complications in the generator armature. Other electrical difficulties, particularly at high speeds and with fully charged batteries, were encountered in the regulator characteristics. One noteworthy feature in this connection is the fact that with the A.C. type of excitation it was possible to use both contacts of tungsten, because the hammer effect jarred any formation of oxide which tended to form, from the face of the contacts.

Working in the other direction, a regulator with a heavy pull was designed, which operated correctly as concerns the above observations. However, a tendency of the current to increase would cause the contacts to open widely, so that the armature struck the core. If this repeated several times rapidly, the contacts would be found welded after one of the closings. Removing the condenser entirely removed the welding or sticking. In this instance the effect was produced by what is known as percussive welding; *i.e.*, a quantity of electricity is discharged rapidly through two contacts which are pressed firmly together.

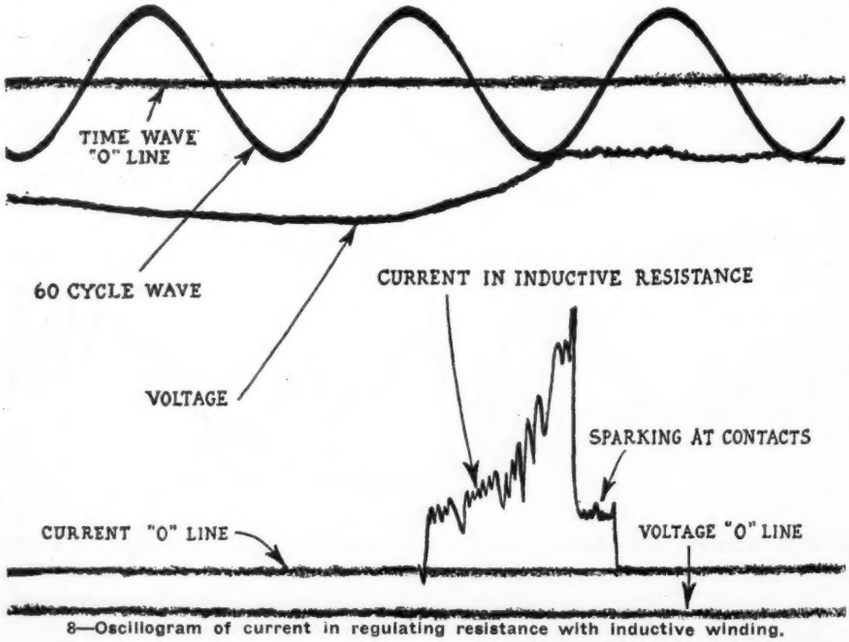
Temperature Compensation

Another problem to be considered is the compensation for the effect of the heating of the regulator shunt coil. The resistance of this winding is raised when heated and in consequence its pull is decreased. To overcome this it is necessary to decrease the counter pull of the spring which holds the contacts together. It has been found in this connection that a certain minimum spring pressure is required to insure that the contacts will properly seat, and that the field current will flow without trouble from contact resistance. Therefore if, to compensate for heating, the spring pressure is reduced to somewhere near this value, the regulator will be unstable and the generator output will vary between wide limits. The pull should therefore be made several times stronger than the required contact pressure, and this ratio has been found to work favorably in this case.

Vibration of the contacts at a high frequency is another desirable feature. It tends to insure stability; *i.e.*, closeness of regulation and the holding of the current or voltage variations close to the average. It also seems to work out well in the problem of sticking contacts, since a strong spring and strong magnetic pull are required to obtain the high frequency, resulting in a more positive action.

Regulating Resistance

The last electrical problem is one of the proper amount of resistance to place in parallel with the contacts. This should be sufficient to control the output at the maximum desired generator speed with a fully charged battery, and yet should not be too great; otherwise, at the lower speeds, when the regulator is just commencing to function, the output characteristic will be unstable and the current (or voltage) will vary between wide ranges until the speed has increased suffi-



8—Oscillogram of current in regulating resistance with inductive winding.

ciently to raise the frequency of vibration to a stable point. Again, excessive resistance approaches the point where the field is nearly open circuited and this will in itself cause inductive arcing at the contacts, which is very destructive.

Lastly, the unit must be mechanically rugged, so that the vibrations and shocks caused by the car motion will not alter the setting or loosen any of the parts. Simplicity and ease of adjustment and repair should be paramount in the design.

A Double Diaphragm Vibrator Horn

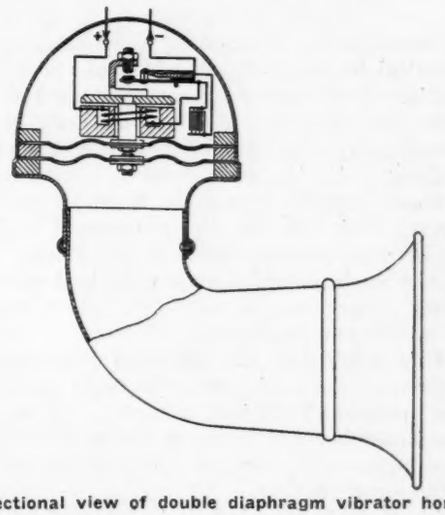
A VIBRATOR horn with a double diaphragm, which it is claimed is unusually penetrating and effective, yet not giving a note such as to create offense, is among the newer products of the Robert Bosch Magneto Co., Inc.

The horn consists of a hemispherical housing containing the tone-producing mechanism, including an electro-magnet, a vibrator and the diaphragms, and a trumpet secured to same. To a clamping band surrounding the housing is secured a flexible member by means of which the horn is supported upon some structural part of the vehicle.

If the horn button is pressed, the circuit of the electro-magnet forming part of the operating mechanism is closed and broken in quick succession. The result is that the armature of the electro-magnet and the diaphragm connected to it are set into rapid vibration, imparting to the air column in the trumpet a rate of vibration which acts upon the ear as a deep note. The diaphragm to which the armature is connected is rigidly held at its circumference by being clamped between two metal rings in the housing. The motion of the interrupter is controlled by the diaphragm, so the vibrations of the two members are synchronous.

Mounted directly in front of the fundamental note diaphragm is located a higher note diaphragm which receives its motion from the former. This higher note diaphragm is claimed to make the tone effective, penetrating and far-carrying. It is claimed that this secondary diaphragm does not produce merely a supplementary noise, but a true musical tone. Owing to the fact that the secondary or high note diaphragm is not loaded with extraneous masses, such as the armature and core, its rate of vibration is much higher, though it is otherwise of substantially the same form as the fundamental note diaphragm. A very exact adjustment insures that the secondary diaphragm is given regular impulses, so that it does not create a noise but a musical tone which, though higher than the fundamental note, bears a certain relation to it as regards rate of vibration.

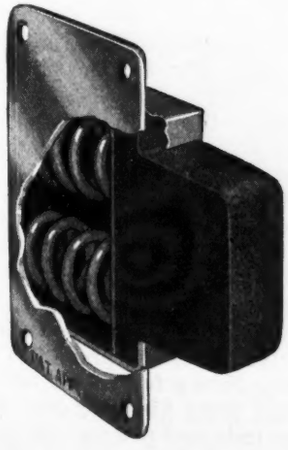
Road tests are said to have demonstrated that the tone of the Bosch horn becomes particularly effective through these higher notes. In order that the fundamental note may not be impaired in its effectiveness by the higher note diaphragm, the latter is provided with openings of suitable size and number.



Sectional view of double diaphragm vibrator horn

The fundamental note diaphragm makes about 300 vibrations per second. To the housing of the mechanism is fitted the trumpet, which is bent at right angles and whose length is proportioned to the rate of vibration of the diaphragms. This results in a resonance effect which is claimed to add materially to the fullness of the tone. The trumpet is rotatable relative to the housing, which facilitates the mounting of the horn on the car.

Spring Type Car Door Cushion



Hushadoor door cushion

A SPRING type of cushion for the doors of motor car bodies has been placed on the market recently. Referring to the cut-away view shown herewith, two small but rather stiff springs are anchored in the plunger box, which take up the recoil of a heavy block tongue of rubber. The idea is to reinforce the checking action of the rubber tongue by the springs, and the pressure of the springs and the rubber together when the door is closed is claimed to be particularly effective in holding it against vibration and rattling.

Among the advantages claimed for this design of door check are that it is unusually compact, that it fits flush within its recess, that it is powerful enough to take up the heaviest slam and that it has a double compensating rebound which automatically takes up wear. The cushion is furnished finished in black enamel, nickel or in natural metal, and is the product of the Velguth Metal Parts Co. of Milwaukee.

Methods Used in the Assembling of 150 Engines per Day

A description of the assembling, inspection and testing operations and equipment employed in fabricating the powerplant used in new Jewett car. Special machine is used to simultaneously grind in twelve valves in one minute. Fan brake employed for final run in and block test of engine.

By J. Edward Schipper

IN the manufacture of engines, as in other products, it is essential to see that savings made possible by the utilization of the best machinery and methods in manufacture are not offset by inefficient methods in assembly.

The manufacturer has working with him specialists on machine design. He is also favored by having competition between manufacturers of various types of machines who eagerly work with him for the purpose of cutting down expenses in manufacture, because these men know full well that the machine which makes the best showing from an economy standpoint is very apt, other things being equal, to be the one purchased.

After this machinery has all been purchased and installed, however, the engine manufacturer has on his own hands the problem of efficient assembly. This is practically all manual labor and involves, consequently, an almost boundless opportunity for the introduction of practical motion study and routing.

With this thought in mind, it is interesting to make a study of the assembly system as laid down for one of the newest engines to be a factor in the automotive field. This is the light six Jewett engine which is made in the engine plant of the Paige Motor Car Co., Detroit. This six-cylinder engine is typical of L-head construction and the methods in use are broadly applicable in this field. The cylinder block casting upon which the engine is built is identical with that of the Paige, which is manufactured as described in AUTOMOTIVE INDUSTRIES some time ago.

The first operation in assembly is to press in the camshaft bearing on an arbor press. The cylinder block interiors are then painted with a special sealing paint which is mixed with alcohol to give it the desired quick-drying properties. The paint employed is red crankcase enamel, made by the Royal Varnish Co., Toledo. This provides a clean, interior surface to work upon, any loose coarse sand, dirt, etc., being permanently sealed to the walls so that it becomes a simple matter to wipe out the engine at any point along the production line or by use of an air blast to blow out particles of foreign matter which do not readily adhere to the smooth surface.

On this particular engine, the valves are inclined to the axis of the cylinders. In order to make the top surface of the block, which carries the valve seat, in a plane at right angles to the valve stem, an arbor is used which fits into the valve guide hole and pilots the cutter which is slipped over the arbor, Fig. 1. This is a hand operation which trues the face of the block, making it possible to cut in the valve seat at the proper angle. In order to maintain accuracy, three arbors are provided. One of the three is so sized that it fits the valve guide hole exactly to line up the operation of cutting away the metal for the valve seat.

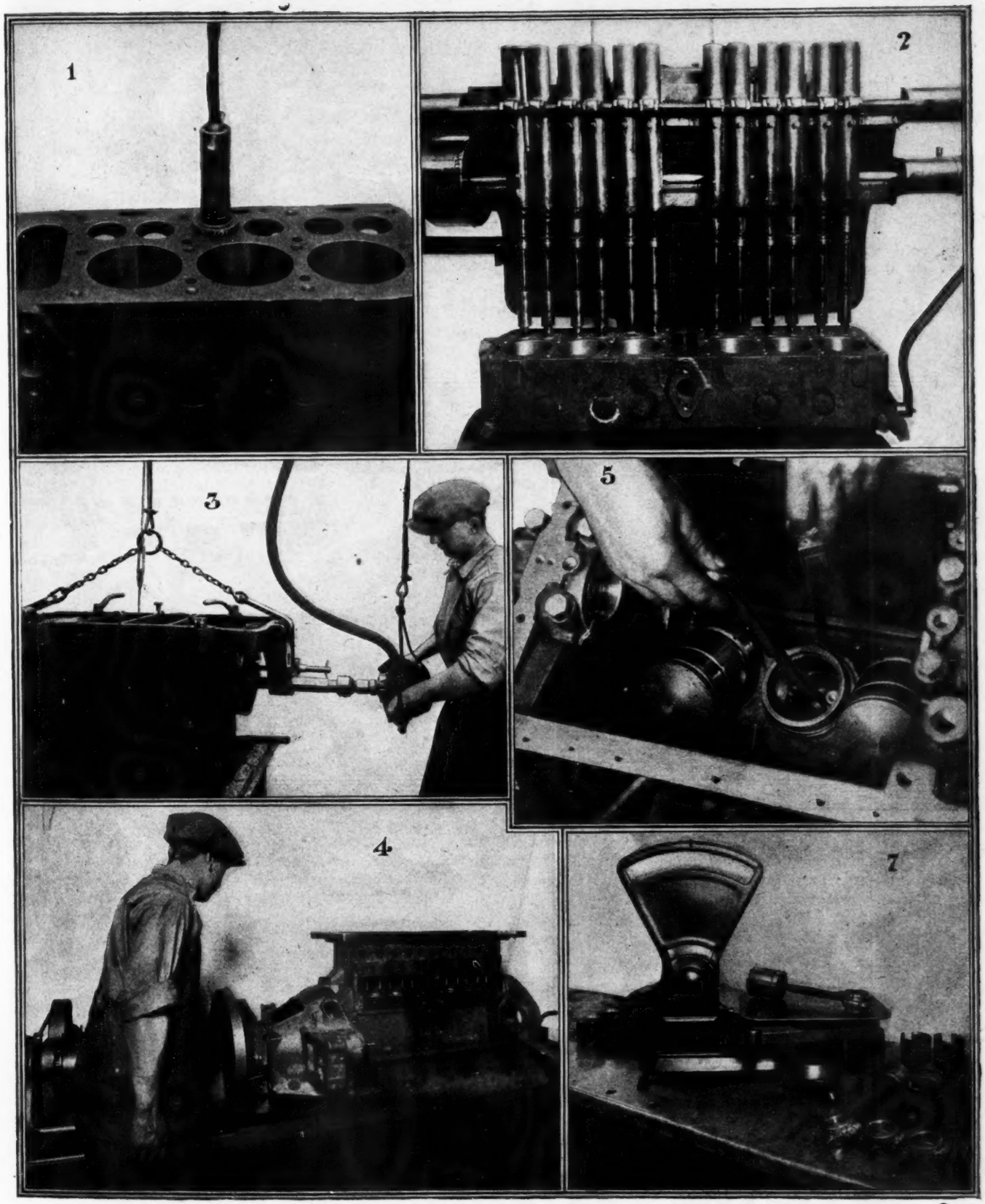
After the preliminary facing by hand, the top of the cylinder at the point where the valve seat is cut is rough faced with an air machine. The valve seat is then rough cut in by hand, and is then given a finish cut with another air machine. This gives a fairly close valve seat and the valves are then selected and stamped with numbers to indicate their position in the block before the grinding operation shown in Fig. 2 takes place. This operation is performed on a special Defiance valve grinding machine which grinds in all twelve valves at a time, giving the back and forth motion used for valve grinding. The twelve valve seats can be ground in 1 minute. After the seats are ground, the block is inspected and the valves all checked with Prussian-blue to assure a clean, even seat around the entire periphery of the valve face.

After the valves are inserted, a false head, which can be seen in Fig. 3, is put over the top of the block to protect the valves and permit the block to be turned upside down and slid along the conveyors without injuring the surface of the block itself. A recess is provided in this false head to prevent contact in any way with the heads of the valves. The main bearings are put in and reamed as are also the camshaft bearings on Martell line reamers, Fig. 3. After the rough and finish reaming operations are completed, an air blast is utilized to clean out the chips. In order to check the reamers, plug gages are put in the bearings of every second case coming through.

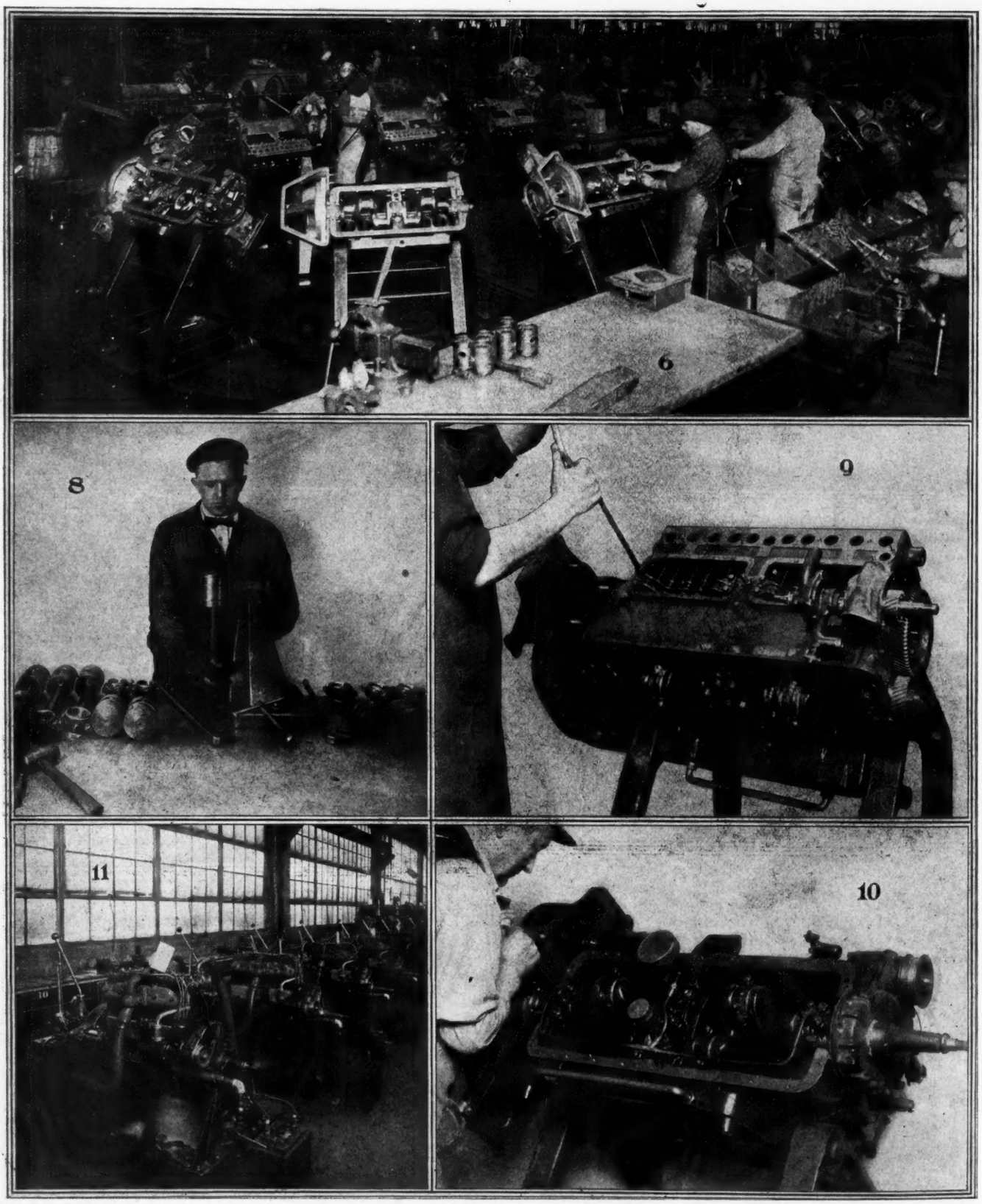
The flywheel housing is put on and this housing is then bored and faced for proper alignment with the transmission shaft, Fig. 4. Location for this boring and facing operation is by two dowels which fit into the front and rear main bearings. Thus, the transmission shaft is piloted accurately in alignment with the main crankshaft bearing.

The pistons are selected to fit the cylinder bores by the use of a feeler ribbon, .004 in. thick, Fig. 5. The pistons must fit snugly against this ribbon. The pistons are weighed in manufacture and held within a limit of one-eighth ounce. The fitting of the pistons is followed by an inspection operation for fit, as well as for weight and clearance.

The crankshaft sub-assembly consisting of the crankshaft, flywheel and crankshaft timing gear is then bolted in place. With this in place, the engine assembly is put on a small conveyor. While on this conveyor, which is shown in Fig. 6, a small group of assembly operations are carried out. The conveyor carries the blocks around in a short elliptical path, during which time a few of the units are added to the block. The water pump assembly and the crankshaft, flywheel, connecting rods and pistons are put on and a driver added to the flywheel for belting in pur-



1—Hand tool used for cutting top surface of block at right angles to inclined valve stem axis. 2—Grinding all twelve valves simultaneously on a Defiance valve grinding machine. 3—Line reaming the main and camshaft bearings for the Jewett engine with Martell reamer. 4—Boring and facing flywheel housing. Location for this operation is on two dowels which are not here visible but which fit into the front and rear main bearings. 5—Fitting pistons into Jewett cylinder block by means of a .004 in. feeler strip. 7—The Jewett connecting rod assembly is held within a maximum variation of ¼ oz. by weight, ⅛ oz. being allowed for the piston and ⅛-oz. for the rods and bearings



6—Small elliptical conveyor system. The units are pushed along this elliptical track on the racks, as shown, and as they progress, the water pump assembly and connecting rods and pistons are put on and a driver added to the flywheel for belting in purposes. The flywheel is put on with the crankshaft assembly. 8—Fixture used for securing squareness of piston and for taking any bends out of the connecting rods. 9—Engine mounted in rack on final assembly line. The universal rack is so designed that the engine can be tilted to any position. Note that the timing gears, water pump and valve tappet assembly have been put in place. The operator is shown just finishing the operation of putting in one of the valve tappet assemblies. 10—Engine turned upside down on final assembly rack to permit access to oil lines and lower parts mounted before under pan is put on. Operator is shown packing rear main bearing. 11—Final block test of Jewett engine. The flat conveyor which brings the engines to the blocks, is shown behind the engines running along under the window.

poses. The connecting rod assembly, consisting of the pistons and rings, connecting rods and piston pins, has come in from a spur in the assembly layout. The connecting rods are weighed, Fig. 7, and held within one-eighth ounce total weight, the big end of the rod being held within one ounce. Thus, a total variation is allowed of one-eighth ounce for the connecting rod and one-eighth ounce for the piston, giving a maximum variation of one-quarter ounce for the entire assembly.

Selective fits are used for the piston pin, this being a light running fit in the bushing which is located in the top of the connecting rod. The connecting rod bearings are put in place and reamed with a Martell reamer on a gage which is piloted to assure squareness of the bearing holes. These rods are reamed, one at a time, in this jig.

In fitting the piston assembly to the cylinder block, an allowance of .003 to .010 in. is permitted in the ring gap. The connecting rods are checked for squareness on a special gage, Fig. 8, and all of the pistons are measured with micrometer for roundness before they are placed in the cylinder bore. Another precaution taken before putting the piston and connecting rod assembly in the cylinder bore is that they are thoroughly cleaned, this being effected by washing them in gasoline, drying them and then flushing them in oil. After the piston and connecting rod assembly has been fitted to the cylinder block, the unit goes on the stand where it is belted-in, in oil. The length of time this belting in process takes places depends on the condition of the motor and perhaps averages an hour.

The driver, which was attached to the flywheel, is then removed and the connecting rod and main bearing cap bolts are keyed and wired in place. The dummy head is removed and the block is placed on a conveyor which takes it down to the beginning of the final assembly conveyor line. Before starting on this line, which is a traveling conveyor, carrying universal racks for the engines, the blocks are again thoroughly cleaned with gasoline and blown out.

The timing gears are next fitted, these including the cam, water pump and crankshaft gears. The stand is so tilted that these operations are very accessible and inasmuch as the engine can be easily turned over, either the top or bottom can be worked upon with equal facility. The valve tappet assemblies are put in, as shown in Fig. 9. There are two of these, each taking care of six valve tappets. The studs for different units such as the heads, manifolds, etc., are placed, and immediately following this the head is put on, also the manifold, hot-air stove, plugs, high tension leads, the horn bracket, starter, priming cocks, etc.

As the engine moves along the distributor, coil units and other small units are added with the engine in the upright position. The engine is then turned over, Fig. 10, to provide access for the parts going on the bottom. The front gear cover is put on, all of the oil lines, the oil pump, packing in the rear main bearing, oil float, etc., are put in place. The clutch and gear-set are attached and the engine is taken over to a slat conveyor which runs along the outside wall of the building, carrying it along to the test blocks.

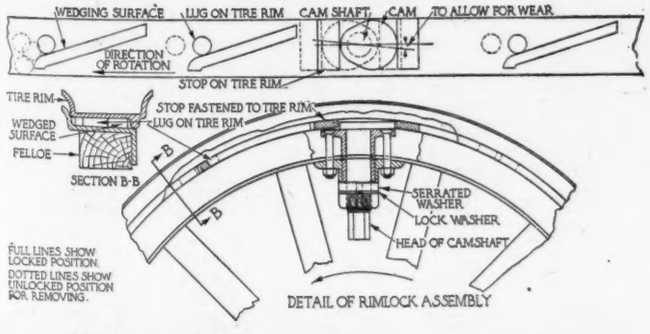
On the way to the block testing stand, the carbureter, name plate, clutch pedals, throttle rods, etc., are put on and the engine is then ready for the test. There are forty of these blocks, Fig. 11, taking care of the production of 150 engines per day. Some engines receive a slightly longer block test than others, as certain requirements have to be met in the way of performance, particularly as regards silence and responsiveness to the carbureter. An average test of approximately two hours is given on the block, a majority of which time the engines are operating under wide open throttle. The engines operate against fan blades, which are carried on the ends of the propeller shafts outside of the building. The load on these fan blades is such that the engine shows r.p.m. equivalent to about twenty-five miles per hour on the road, with wide open throttle.

After leaving the block test, the engine receives another inspection, the tappet covers are put on and other finishing touches given. A final inspection is made just before reaching the shipping room, the latter inspection including the checking of the transmission lock, which is in unit with the transmission. The engines leave this final inspection and are placed on trucks and carried over to the main plant where chassis assembly takes place.

A New Demountable Rim

A RIM in which a single cam takes the place of six or eight lug bolts usually employed to hold a demountable rim in position is being offered for consideration of rim and wheel manufacturers by H. N. Moody.

The wheel band is made with ten wedging surfaces which engage against lugs on the tire rim. These surfaces are brought into engagement with the lugs by relative movement between the wheel band and the rim, brought about by turning the cam. This forces the lugs behind the wedging surfaces and is said to give a high factor of safety against lateral stresses. When the rim is in position, the cam is locked by tightening the nut, threaded over the end of the camshaft, which projects radially inward through the felloe. The nut presses against a lock washer which, in turn, bears against a second washer, the under surface of which is serrated and engages with mating serrations in the sleeve or bushing in which the camshaft turns, as shown in the accompanying cut.



Details of Moody demountable rim and tire band showing cam action operated from a single point to lock the rim in place

THE Bureau of Foreign and Domestic Commerce reports that the final entry date for the Barcelona Automobile Show has been postponed to May 15. Up to date 13 entries have been made by American firms and 25 by concerns of other nationalities.

The show will be held from May 24 to June 5. The following are the minimum prices for exhibits:

	Pesetas
Passenger cars, 40 cubic meters space.....	2,600
Motor trucks and tractors, 25 cubic meters space	625
Motorcycles, tires and accessories, 10 cubic meters space	450

Additional space will be available at proportionate prices.

The Philippines as a Market for Automotive Products

The Islands have felt the depression but a general optimistic feeling prevails. The author describes the present situation as to marketing, roads and financial condition and discusses the local problems in full.

By Roy C. Bennett

THE Philippine Islands, probably the most thoroughly motorized part of the Orient, had a total of considerably more than 13,000 motor vehicles, exclusive of tractors, in operation at the beginning of this year. The last registration receipt issued by the automobile division of the Bureau of Public Works in 1921 showed 13,341. This number included motorcycles. Tractors are not registered with the bureau, and there is no accurate count of their number.

The year 1921 was not an active one for the motor car business in the islands, which fact is accounted for by the general dullness of insular commerce, accompanied by a shortage of money. Some of the largest dealers in automobiles had a close call, although the close of the year found all of them breathing easier, due to the fact that business had picked up to some extent and the prospects were generally brighter. The early part of the year has brought no boom but a general optimistic feeling prevails.

The following is the Bureau of Public Works tabulation of motor registration to the end of the year:

	Old	*New*	*Total*
Private cars	5,446	1,020	6,466
For hire cars	1,838	228	2,066
Public utility cars	172	5	177
Private trucks	726	146	872
For hire trucks	407	52	459
Public Utility Trucks	685	61	746
Garage cars	364	33	397
Garage Trucks	207	13	220
Government cars	326	49	375
Government Trucks	383	67	450
Private motorcycles	682	75	757
Government motorcycles	240	116	356
Total	11,476	1,865	13,341

In this table new cars include all not formerly registered in the Philippines, which means that people coming from the United States and bringing their cars with them would register it with the Bureau of Public Works as a new car on their arrival. This is done in relatively few cases except with army people, who can bring their automobiles free of charge on transports, and many officers do so. Some offer them for sale immediately upon their arrival, believing that, due to the cost of shipping which dealers must add to their prices, they can get ready sales. This theory was correct until the slump of business threw a large number of second-hand cars on the market.

Dealers in the islands do not look for any rapid recovery or sudden boom of their business, although they think the worst was passed months ago. Broadly speaking, they are marking time, resting content with the windfall sales which come their way and living in hopes that an improvement of business conditions generally will restore health and vigor to their own line sooner or later. The markets for Philippine products started to recover early this year and there is hope that the movement of Philippine produce, of which sugar is the most important, will improve materially.

Filipinos, who are proud in the extreme, are lovers of automobiles. Manila dealers sell a few cars to Americans and foreigners, but it is the Filipinos who give them the largest business. When sugar was high, Filipino planters had money in quantities they had never before dreamed of, and they bought cars. Hundreds of automobiles, many of them high-priced, went to the provinces, meaning the rural districts.

A car is more of a necessity for the average man in Manila than for the average man in a city of the same size in the United States. Climatic conditions—the heat when maximum and the floods in the rainy season—make it almost impossible for one to walk any distance to and from work. Street car service is inadequate and the street rigs, which are two-wheeled horse-drawn vehicles, are unable to handle the crowds at rush hours.

Relatively fewer persons appear to drive their cars in the Philippines than in the United States, partially because it is customary to have more servants here and partially because chauffeurs are cheaper than at home. Filipino chauffeurs get from 40 to 80 pesos (a peso is roughly a half dollar) a month. They are not the best chauffeurs, particularly as to mechanical upkeep of cars, neither are they particularly poor. The cost of upkeep of a car is about the same as in an American or European city. Gasoline is about twice as expensive, storage is cheaper; tires are higher, but garage charges compare favorably. The climate is hard on cars, as it also is hard on the roads over which they travel.

The status of roads and the history of road building can be understood through a study of the following table from the Bureau of Public Works:

PHILIPPINE PUBLIC WORKS STATISTICS

	Total mileage of roads in the Philippines			
	First Class roads	Increase Per cent	Second Class roads	Third Class roads
1907	(a) 303			
1908	423	40		
1909	609	44		
1910	764	25	(a) 641	(a) 2,074
1911	987	29	664	1,837
1912	1,143	16	1,342	1,999
1913	1,303	14	1,264	1,938
1914	1,593	22	1,258	1,787
1915	1,906	20	1,294	1,896
1916	2,137	12	1,271	2,138
1917	2,323	9	1,278	2,109
1918	2,542	9	1,253	1,944
1919	2,796	10	1,234	1,932
1920	2,920	4	1,266	1,914

(a) No accurate statistics before 1907 and 1910, respectively.

Years preceding 1914 are for twelve months ending June 30, 1914, and following years are for twelve months ending December 31.

Note:

First-class roads in this table include not only First-class roads officially designated but also First-class roads not officially designated as such.

W. Cameron Forbes, strong advocate of road building and a believer in the theory that one of the weaknesses of the Philippines was poor transportation, started extensive highway construction when he was Secretary of Commerce and Police in the Philippines, and when he advanced to the position of Governor-General of the archipelago he made this one of his hobbies. The road system has reached the point where maintenance is a serious problem and engineers are puzzled over the question of the proper kind of road. At present macadam is in the lead, but the heavy traffic, motor vehicles and bull carts, breaks up the surfacing rapidly. The heavy rains in the rainy season do immense damage, while the long dry seasons permit rapid wear through blowing dust.

Cars are used pretty much throughout the islands, but naturally the largest number is to be found in Manila. The drive from Manila to Baguio, a mountain resort, is popular with residents and tourists, as the mountainous part of the drive is scenically most beautiful.

The medium-priced car is the most popular, with the exception of the Ford. However, a number of expensive cars are in use.

Local dealers fear no strong competition from European cars, and the American manufacturer has a sure market, because of the heavy duty on them. This duty amounts to about 25 per cent, and even without this duty the American car is more popular with the Filipinos, who prefer the appearance of American cars, according to a dealer who has handled both and who had several French cars in his salesroom when he made the statement.

Motor trucks are important in the commercial life of the islands. In the first place they play an important rôle in the freight business. This should be fully understood when one recalls that horses large enough for wagoning are extremely scarce, mules are strangers and the railroad service in the islands falls far short of what it should be. These conditions also have constituted a call for the motor truck to enter the interurban passenger and freight business. It performed its task so well that it has incurred the enmity of the railroad, and remember that the railroad in the Philippines is government-owned. This means that the truck lines, represented in the foregoing table of registrations by "public utility trucks," have the government in opposition to them. Many handicaps are put in the way of the man who wants to start a truck line, if the railroad has a line which might by any possibility be injured directly or indirectly by his competition. It is necessary to get a permit from the government to operate any line of trucks under the head of public utility, and there are a thousand and one technicalities through which the issuance of permits may be delayed or on which they may be denied. This explains why hundreds of applications for permits have piled up in the office of the public utility commissioner awaiting action. The small number of trucks licensed for public utility purposes in 1921 tells the story.

The height to which the price of sugar soared was responsible for an abnormal interest in growing cane. This brought about a heavy demand for modern machinery, including farm tractors. For a time the importer who sold tractors was the one who could supply them fast enough. At that time a good tractor agency was looked upon as a gold mine, but when the sugar business deflated it carried with it the tractor business. To-day the warehouses of importing companies are filled with tractors, and there has been some talk of sending some of them back to the United States, believing that they can be sold there more readily than in the Philippines.

Peru a Market for Tractors

TRACTOR selling in Peru has been retarded by serious handicaps during the past year due to the adverse rates of exchange and to the general business depression, according to a report compiled by the Agricultural Implement Division, Department of Commerce. Few sales have been made in the past few months, resulting in the accumulation of considerable stocks. The American tractor has a practical monopoly of the market, as it was first introduced and is best known. The only European tractors now offered are the Fiat (Italian), Renault and Somua (French) and the Austin (British). A German tractor was exhibited during the recent centennial industrial exposition, but did not make a favorable impression on account of its apparent clumsiness. The Fowler steam tractor is used to a considerable extent for heavy plowing on sugar plantations.

Only 30 to 35 per cent of the haciendas on the coast are supplied with tractors, so that the possibilities are far from being exhausted. But few tractors are used in the interior provinces. A few are working satisfactorily in the high altitudes, although at an elevation of 10,000 feet or more it has been found that the efficiency of the motor is affected, making it necessary to use large pistons to secure the desired compression. The mountainous nature of the interior valleys constitutes a further obstacle to the use of modern machinery. However, the accessible coast valleys are the most important regions, agriculturally, of the country, and a return to normal conditions may be expected to be followed by a greatly increased use of tractors and other agricultural equipment.

There are now 14 makes of American tractors represented in Peru. There are few first class houses available as representatives of additional tractors and the manufacturer wishing to enter the market should send his own representative in order to make a satisfactory connection.

With few exceptions all tractors used in Peru to-day are of the wheel type, and any other type, it is stated, is not likely to be purchased without considerable propaganda. The first tractors brought to Peru were of the track-laying type, but did not find favor, possibly due to the fact that the machines were not properly handled and demonstrated. Only one American tractor of this type is on the market, and one European, the Renault, which has but recently been introduced. The medium weight, solidly-built wheel tractor of from 20 to 35 hp. is said to be the best adapted to the average Peruvian plantation. The lighter types have sold well on account of their low cost. Heavy and powerful tractors are not favored, as cultivated tracts are comparatively small. Garden tractors are not used.

Two and three-bottom tractor plows are most common and the mold boards are usually 12 or 14 inches, although the latter is considered by some to be too large. But few tractor disc plows are used, the chief criticism against them being that they break up weeds into such small pieces that their removal with harrows is difficult.

What the Industry Thinks About Used Car Plans

An analysis of answers to a questionnaire sent by the N. A. C. C. and the N. A. D. A. to manufacturers and dealers. A brief outline of the attitude of the industry toward proposals for improving the used car situation.

A VERY great deal has been said on the subject of used cars and there will undoubtedly be more in the future. The value of the matter written has not always been great, but the indirect value, that of bringing the problem out into the open, has had a value which should be more apparent as time goes on. It is necessary that manufacturers and dealers take an interest in the subject if any improvement is to be brought about and one of the best ways to do this seems to be to give wide publicity to ideas and methods which members of the industry are considering or actually using.

In order to determine just how manufacturers and dealers felt regarding the various plans proposed, a country-wide survey was made by the National Automobile Chamber of Commerce and the National Automobile Dealers' Association. This survey was made by sending out a questionnaire bearing sixteen questions. The replies from manufacturers and dealers were taken each as a group and analyzed. Each group was given equal weight and the answers combined to give what may be taken as the industry's vote on each of the sixteen questions.

The results of the questionnaire are given in percentages in the accompanying table.

An analysis of the table would lead to the following conclusions as to the industry's belief in the feasibility of each method:

1. Manufacturers heartily in favor of local appraisers, dealers slightly less so, and the industry standing two to one in favor.

2. Both manufacturers and dealers about equally opposed to dealers' co-operative reconditioning. Four to one against it as a whole.

3. Manufacturers more opposed to manufacturers' co-operative reconditioning than to No. 2, dealers somewhat less, the industry standing against as in No. 2.

4. Manufacturers three to one against factory reconditioning; dealers not quite two to one and the industry not more than two to one opposed.

5. Manufacturers favor dealer reconditioning nine to one; dealers four to one, and the industry as a whole in favor five to one. The industry shows greatest interest and closest agreement on this question.

6. Manufacturers evenly divided on used car exchanges; dealers slightly in favor; the industry seven to six in favor.

7. Manufacturers two to one against trading only own line; dealers about two to one against, and industry two to one against.

8. Manufacturers favor advertising used car value three to two; dealers seven to four and the industry eight to five.

9. Manufacturers opposed fourteen to one against longer discounts; dealers nine to seven in favor and the industry combined two to one against.

10. Manufacturers evenly divided on dealers' co-operative advertising; dealers slightly more in favor and the industry ten to nine in favor.

11. Manufacturers two to one against manufacturers' co-operative advertising; dealers in favor four to three. The industry seven to five against.

12. Manufacturers favor used car guarantees eight to one; dealers about two to one and the industry combined ten to three. Great interest expressed.

13. Manufacturers in favor of used car shows three to one; dealers not quite two to one and the industry slightly more than two to one in favor.

REVIEW OF USED CAR REFERENDUM

	Compared by Percentages												Summary of Vote		
	Manufacturers				Dealers				Combined						
	Yes	No	Doubt	No Ans.	Yes	No	Doubt	No Ans.	Yes	No	Doubt	No Ans.	Mfrs.	Dealers	Combined
1. Local appraisers	63	23	9	5	51	36	6	7	57	29.5	7.5	5	Yes*	Yes	Yes
2. Dealers' co-operative reconditioning	12	66	11	11	15	67	4	14	13.5	66.5	7.5	12.5	No*	No*	No*
3. Manufacturers' co-operative reconditioning	6	80	3	11	21	55	8	16	13.5	67.5	5.5	13.5	No*	No*	No*
4. Factory reconditioning	17	57	11	15	28	50	6	16	22.5	53.5	8.5	15.5	No*	No	No*
5. Dealer reconditioning	74	6	14	6	67	16	3	14	70.5	11	8.5	10	Yes*	Yes*	Yes*
6. Used car exchanges	37	37	9	17	45	33	11	11	41	35	10	14	Tie	Yes	Yes
7. Trading own line only	23	63	6	5	30	56	5	9	28	59.5	5.5	7.5	No*	No	No*
8. Factory evaluating used models	49	34	17	0	52	30	9	9	50.5	32	13	4.5	Yes	Yes	Yes
9. Longer discounts	6	83	3	8	48	37	8	7	27	60	5.5	7.5	No*	Yes	No*
10. Dealers' co-operative advertising	40	40	9	11	44	36	6	14	42	38	7.5	12.5	Tie	Yes	Yes
11. Manufacturers' co-operative advertising	23	60	3	14	43	33	7	17	33	46.5	5	15.5	No*	Yes	No
12. Used car guarantees	71	9	17	3	57	29	9	5	64	19	13	4	Yes*	Yes	Yes*
13. Used car shows	60	17	14	9	51	31	9	9	55.5	24	11.5	9	Yes*	Yes	Yes*
14. Accepting dealers prospect estimate	46	26	28	0	54	16	10	20	50	21	19	10	Yes	Yes*	Yes*
15. Refusing old truck trades	34	11	9	46	60	11	4	25	47	11	6.5	35.5	Yes*	Yes*	Yes*
16. National used car markets	11	51	9	29	48	22	6	24	29.5	36.5	7.5	26.5	No*	Yes*	No

*Indicates that vote was more than 2 to 1.

14. More manufacturers in doubt than say "no" to accepting dealers new car quota estimate; dealers in favor three to one and the industry two to one.

15. Many did not answer the question of refusing old truck trades, but comparing only the "yes" and "no" votes the manufacturers are in favor three to one; dealers six to one and industry four to one.

16. Manufacturers four to one against national used car markets; dealers two to one in favor and the industry as a whole six to five against.

As may be seen by a glance at the answer to question No. 15, both manufacturers and dealers are against trading in old trucks and the industry is against it with a ratio of four to one. If it is going to be possible to bring about this condition in the merchandising of trucks it would be well to see wherein are the fundamental differences which would permit it with trucks when it is generally considered to be impossible with passenger cars.

The report of the survey goes on to say that many dealers believe that the used car situation is their problem and that the manufacturers can only help in one way, and that, to refrain from overloading them with new cars. If this is done they believe that overtrading allowances will not have to be resorted to. It may be seen by reference to question No. 14 that dealers registered emphatic approval to having manufacturers accept their estimates of new car quotas, believing no doubt that this would indirectly ameliorate overtrading.

In connection with this subject of the manufacturer helping the dealer solve the used car problem it might be well to quote from an article appearing in AUTOMOTIVE INDUSTRIES of Jan. 26, 1922, page 160.

How the Manufacturer Can Help

"Since the actual solution of the problem lies with the dealer the manufacturer's part is to help the dealer and make conditions for him as favorable as possible. This can be done in several ways, important among them which are the following:

"1. General educational methods, showing the dealer the folly of over-allowance from the standpoint of sound business methods and profits.

"2. By urging the dealer to recondition cars properly before making a resale and to give a guarantee with his used cars commensurate with what he honestly believes the performance of the car will warrant.

"3. By urging the dealer to build confidence in used cars by keeping used car sales, service and advertising methods at the highest level both ethically and materially.

"4. By aiding the dealer in market analysis methods; showing him how to properly estimate the buying capacity of his territory. In some cases the manufacturer's organization can make market analyses and pass them on to the dealer for his use.

"5. By aiding the dealer in actually reconditioning cars. This is not practical in every case, of course, but may properly be considered in many instances.

"6. By selling parts for rebuilding cars at a lower price than that charged for regular repair parts.

"7. By planning and adjusting factory production on the basis of comprehensive market analyses, so that there will not be a temptation to overload the dealer."

The report mentions that many emphatically recommend that all manufacturers stop making trade-in allowances to their dealers. Undoubtedly this practice works unfairly to those who do not receive this allowance and it may be said to run counter to the efforts that are being made to lessen the used car evil, namely, to deflate values and put them on a sound basis where values would have a meaning which is readily understood.

"Very many think altogether too much is being made of the used car problem—that it is a bugaboo—whereas actually it is but a business condition for which the manufacturers are somewhat to blame. When new cars go down, the dealer has no protection on his used car, showing dealers should promptly dispose of used cars. The whole business they aver will rectify itself when general business conditions are better."

Some Suggested Plans

The survey report contains many suggested plans which may be well to mention briefly.

Mr. H. H. Brooks, sales manager of the Nordyke & Marmon Co., offers a national used car company plan which is briefly:

"A national used car corporation formed and operated under the supervision of the passenger car manufacturers, dealers and bankers, its sole business to be to buy, recondition and sell used cars. It will have a central headquarters with main branch houses in various zones, according to geographical conditions and potential markets. The branch houses will be reconditioning plants distributed so that cars can be driven in instead of shipped. Subbranches will be purely retail establishments, except for minor repairs and adjustments. . . ."

A certified car plan was proposed by Homer McKee, the object being that certifying a car would remove the stigma from the used car business, and that a car must reach a certain standard of condition before it could be certified. "The Certification Board would be composed of fair, competent, unprejudiced mechanical experts."

Among other plans proposed are the National Appraisal Company plan, the Scranton plan, Used Car Auctions, Taylor Selling Service, Boston, Saginaw, Oklahoma and Cincinnati plans.

"A rather drastic and perhaps visionary proposal is to retire all cars over five years old, the manufacturers and dealers to provide capital for junking such used cars, the dealer being compensated by saving the expense of carrying used cars indefinitely and being enabled to carry larger new stock and the manufacturer by the salvage of parts usable for service."

The words "drastic" and "visionary" are well advised, for a careful consideration of this proposal cannot help but show up many inherent weaknesses as well as hidden dangers. It would seem impossible to carry out any plan of this nature without causing inflation and other troubles that the industry is trying to get away from.

FOLLOWING is a complete list of the places and countries to which letters may be sent at the rate of 2 cents an ounce or fraction thereof:

Alaska
Antigua
Anguilla
Argentina
Aruba
Bahamas
Barbados
Barbuda
Bermuda
Bolivia
Bonaire
Brazil
British Guiana
British Honduras
Canada
Canal Zone
Colombia
Costa Rica
Cuba
Curacao
Dominica
Dominican Republic
Dutch West Indies
Ecuador
England
Grenadines
Grenada
Guam
Haiti
Hawaii
Honduras (Republic of)
Ireland
Jamaica
Leeward Islands
Martinique
Mexico
Montserrat
Newfoundland
New Zealand
Nevis (Leeward Islands)
Nicaragua
Panama (Republic of)
Peru
Philippines
Porto Rico
Redondo (Leeward Islands)
Saba (Dutch West Indies)
Salvador
Samoa
Shanghai, China
Scotland
St. Christopher
St. Lucia
St. Martins (Dutch part of)
St. Vincent
St. Croix
St. Thomas
St. Kitts
St. Eustatius
Tobago
Trinidad
Virgin Islands (British)
Virgin Islands (U. S.)
Wales
Windward Islands

Aluminum, Forged and Cast

Editor, AUTOMOTIVE INDUSTRIES:

I am sorry that Dr. Rosenhain construed my criticism of his article as one of hostility to the proper function of the metallurgist.

I am the last man to raise the question of engineer vs. metallurgist, except to maintain time-honored traditions good for both, as I am very familiar with, and appreciative of, the assistance given by the metallurgist to the engineer. Nevertheless when things go wrong where the use of metals is concerned the engineer is usually and rightly held responsible, so that the metallurgist should consider his recommendations very carefully.

May I remind Dr. Rosenhain that out of a humble effort of mine came the Automobile Steel Standardization Committee of which I was Chairman, thus bringing together the metallurgists and engineers in the British automobile industry as never before to their mutual benefit and the clarification of the automobile steel situation.

Incidentally it afforded me an excellent opportunity of noting how my metallurgical friends differed and disputed with each other upon points that I in my blissful ignorance had thought were settled.

Dr. Rosenhain complains that it is useless for me to "demand vehemently" "that the metallurgist should state the value of all materials in terms of the *steel* the engineer knows." Misquotation does not help controversy and I would refer him to my letter in your article of December 8, 1921, in which I said "it is particularly the field of the metallurgist to develop the alloys of aluminum and to give to the engineer a clear idea of the properties of these alloys in terms of the materials he is already using and with which he is familiar" which is quite a different thing as the argument is far wider than that of replacing steel by aluminum. This is my vehement and useless demand. It may be useless but hardly vehement.

I would also quote Dr. Rosenhain's statement "Mr. Pomeroy wants to know what takes place before failure begins, but what the engineer really wants to know is at what stress failure really will begin."

Again referring to my letter I actually said "The engineer wants to know what happens before failure commences or rather precisely where it commences on the stress strain diagram?"

I cheerfully agree with Dr. Rosenhain in that my ideas on stress or mechanical hysteresis are distinctly vague. I have read most of the work on this and allied subjects that has come my way for many years past and the further I go the hazier I get. My lack of understanding persuades me that I may be a typical engineer after all!

I had certainly no intention of "attacking" Dr. Rosenhain in general terms for putting forward suggestions as to the utilization of new materials upon which he is an authority, but if it is a retrograde step for anyone to criticise in a perfectly specific manner what strikes him as a very dubious suggestion, then I am all for retrogression not only as an engineer but as a human being. But what really inspired or rather actuated my letter was Dr. Rosenhain's advocacy of the forged aluminum piston on the grounds that forgings were stronger and more reliable than castings.

This reliability it appears from his last letter is in respect of foundry wasters. I would only say that I am intimately acquainted with a plant which produces more aluminum pistons for automobiles in a week than are absorbed by the whole British industry in three months and that the percentage of machine shop wasters due to foundry defects is less than 1 per cent.

I am prepared to buy Dr. Rosenhain a perfectly good dinner if he will accept it on my next visit to England if his percentage of scrap at the N. P. L. in preparing forged aluminum test pieces with screwed ends is not considerably greater than this. I submit this as an example of quasi production of a simple order.

Dr. Rosenhain's authority is so world wide that I think it a very great pity that he should have advocated the forged aluminum piston *on the grounds* he has set forth. The aluminum piston confers more improvement upon an engine for less expenditure than can be obtained possibly in any other way. It has had its troubles due to causes very remote indeed from those cited by Dr. Rosenhain and these troubles have by patient investigation and unwearied experiment been gradually overcome. I suggest that the best advice to Dr. Rosenhain's production engineer is to get after the foundry and see whether or not the fault lies there.

On the general question of castings and forgings, Dr. Rosenhain is quite mistaken when he thinks my "attack" on him is due to his not agreeing with me on the desirability of employing castings for frame construction. If only he had seen what I have of the fantastic abuse a cast aluminum frame will stand he will realize that his disagreement in face of an accomplished fact would not be a cause for irritation.

He asks me if in pre-aluminum days I would have used cast iron in place of steel. The analogy is, of course, unfair as the alloy used in my cast aluminum frame has considerable ductility and a relatively high tensile strength although not a heat treated alloy, but if I had thought of it I should have investigated a malleable iron frame.

Incidentally may I ask if in the said pre-aluminum days Dr. Rosenhain would have recommended the use of steel pistons for automobile engines in place of cast iron pistons on the grounds of strength and reliability. This *is* a perfectly fair analogy.

I know the idea of a cast aluminum frame is a little startling, but the first consideration underlying frame design is stiffness rather than strength and the second, reliability of fastenings. The average stress in a frame is really very low and in a cast frame may be more or less uniform. The problem of fastenings with a cast frame is, of course, very simple as most of these can be made integral without incurring foundry difficulties. I suggest that there is no practical difficulty in producing a frame section 4 feet long of 8x2½ in. overall dimensions having a mean thickness of 9/32 in. with box sections at points of relatively high stress. The heavier parts where the sections are bolted together can be chilled without trouble and core prints can be provided ad libitum.

The net result is that in at least one case a frame has been made which weighs some 160 pounds complete while a corresponding steel frame weighs about 300 pounds. Of the reliability and strength of this cast frame I am convinced after some 32,000 miles of brutal testing. I would, however, view with apprehension the task of reducing the weight to say 120 pounds by using forged aluminum on account of the difficulties involved in securing to a comparatively soft and thin section parts such as engine brackets, cross members and spring horns.

I do not understand Dr. Rosenhain's statement that "a different ratio of density to elastic modulus may bring with it unexpected results" in connection with springs. The ratios of density to elastic modulus for forged aluminum and steel are approximately as 106 to 108 respectively and it is difficult to see that this can have much effect.

My calculation is not limited to material under uniform stress but applies equally well to say a laminated spring in which the maximum stress is reached in every section. While experiment frequently reveals considerations not disclosed by accepted theory it is at least worth while to start with some clear idea of the latter.

May I repeat that what the engineer wants is information not necessarily in terms of steel but in terms of the materials with which long experience has brought some degree of familiarity.

The principal difficulties in using modern aluminum alloys broadcast for automobile purposes are not related to their stress resisting qualities, but to softness and lack of wearing capacity and some ingenuity is required to overcome these characteristics. In these matters alone there is ample room for discussion and if Dr. Rosenhain can give us the benefit of the metallurgists' viewpoint and experience I should be very happy to pursue the congenial role of devil's advocate.

Dr. Rosenhain seems to interpret all the engineering problems to which he has referred in terms of the capacity of the parts in question to withstand stress.

Automobile engineering particularly abounds with instances where stress considerations are secondary to others, as for example a crankshaft where stiffness and resistance to wear are the determinants and a low carbon steel crank is amply strong enough in most cases if it would only withstand wear. Similarly with connecting rods, wrist pins, pistons, gears, camshafts, cylinders, flywheels, clutches, hubs, brake drums, frames, etc. Very few of these are stressed at all highly. In fact the principal parts of an automobile which really have to work for their living from the stress point of view are the axle springs, valve springs, transmission shafts and swivel axles, and in most of these be it noted wrought material is used in its very simplest geometrical form. It is this reasoning which underlies the case for the casting in general and the aluminum casting in particular as against the forging for very many parts. Metallurgists in general seem obsessed by the stress resisting qualities of the materials they advocate and specify and in so doing exhibit what is in my considered opinion a lack of realization of the problems before the designing engineer.

I think that if a fraction of the energy which has been devoted to the determination of the straight physical properties of materials had been spent on the investigation of the idiosyncrasies of materials in the fabricated form, i.e. upon macrostructure rather than microstructure, the engineer would have a wealth of data he does not now possess.

If Dr. Rosenhain has the time and inclination to continue this discussion I trust he will do so with two things quite clear in his mind. One, that apart from a certain degree of good humored satire which is the salt of discussion I have nothing other than a profound respect for the metallurgist, the mysteries of his science and the work he has done; two, that Dr. Rosenhain's eminence is so unquestioned that I hope he will accept criticisms, without regarding them as attacks, personal or otherwise, of suggestions which I venture to think are rather outside his life's work from one who at least can talk from the viewpoint of a fairly extended experience of the problems of automobile design.

LAURENCE H. POMEROY.

The Garden Tractor

Editor, AUTOMOTIVE INDUSTRIES:

In your issue of March 2 there is an article by Fred C. Ziesenheim on the garden tractor. We would like to call your attention to the statement that the writer makes wherein he states a 9-in. plow is a minimum size moldboard plow that can do satisfactory work. We should like to advise that a good many hundred users of our device are doing satsifactory work with the Utilitor handling an 8-in. plow.

Another statement is made that the engine should develop 5 h.p. to handle a 9-in. plow 8 in. deep. This is deeper than it is possible to do good work with a 9-in. plow. Our machine handles a 10-in. plow satisfactorily and we do not have 5 h.p., but 2 1/3 h.p., approximately at the drawbar. It is not a question of horsepower—it is a question of how much traction you can get, and with our job we can slip the wheels with the horsepower available.

Plows, however, are generally considered O.K. when turning a furrow one-half their width in depth.

To further quote this article: "The tractors which cannot pull a 9-in. moldboard plow should be definitely designed and marketed as a non-plowing type until such time as some other form of plow is available which will permit narrower furrows." We should like to ask why. Isn't any machine capable of pulling a plow a plowing type? One which does not handle a plow is known in the trade as a cultivator or a motorized hand cultivator. The writer further mentions the disk type plow for tractors as holding possibilities for small tractors. Why not the moldboard type? Does he realize the impracticability of his suggestion? Does he know what the demands are by a disk plow on a garden tractor? Under ordinary circumstances three, and probably four, horses are required to pull a 16-in. disk plow. These plows are made in 14-in., 16-in., 18-in., and 24-in. sizes.

He further mentions "A proposed method of attachment for small tractors is to place the implements in front of the tractor." Our new model does this. With us it is not a proposed method.

We further take exception to all of paragraph two on page 508, as it is not based on facts.

Your writer further states that: "The small tractor is not strictly a general purpose machine, as it can only be designed to meet a limited class of service." If there ever was a general purpose machine we think it is the type we make. Can your writer show us a machine of greater utility?

LON R. SMITH, Vice-President,
MIDWEST ENGINE COMPANY.

ANYONE seeking information on the source, structure, chemistry or uses of coal will find a very complete compilation of these facts in the "Coal Manual" by F. R. Wadleigh, recently appointed head of the Coal and Coke Section of the Bureau of Foreign and Domestic Commerce.

This manual will be of particular value to salesmen, buyers and users of coal because it is written in a non-technical, practical way for convenient reference. The National Coal Mining News, Cincinnati, is the publisher.

The Method of Analyzing Territorial Markets

Careful study must be applied to territorial markets and the different factors which have direct bearing on them. In order to make the involved considerations apparent, the method of analyzing markets is applied to a specific company and territory and followed through in each detail.

By Harry Tipper

THE statistics from examinations which have been made previously in these articles concerning the marketing of automobiles and the bases of marketing plans require further extension into the territorial development, in order to show the effect of this consideration upon the layout for the future marketing in the next sales period. In order that the consideration involved may be pointed and specific, we are taking the example of the Jones car, manufactured in Ohio, in the $2,000 to $3,000 price group, which company has been securing 20 per cent of the market of this price group with the expectancy of 20 per cent, plus, for 1923 in the total company. The expected requirement for cars in this class for 1923 is 72,000 cars. The expected market for the Jones car for the same period is 15,000 cars. One of the important territories of the Jones car is the Pacific Coast, which has been handled up to the present time by one large distributor located in San Francisco, with branches in Portland, Ore., and Seattle, Wash. This distributor showed the following position for 1921 in each of the three states represented:

CALIFORNIA.—At the beginning of 1921 this distributor had 30 dealers, of which 15 gave up the agency, went out of business or were otherwise eliminated. He has secured 6 new dealers, so that at the beginning of 1922 there are 21 dealers in the State of California. The expected market for the Jones car in California for 1921 was 750. The sales of the distributor were 650, of which 30 per cent were at retail in San Francisco—or 195 cars —leaving 455 cars sold at wholesale through the dealers. The 15 dealers who remained on the books throughout the year took 320 out of the 455 cars, or an average of something over 20 cars each. The 15 dealers who went out during the year sold between them 75 cars before they went out, while the 6 new dealers put on during the year sold 60 cars.

WASHINGTON.—At the beginning of 1921 this distributor had two dealers, one of whom went out of business. The expected sale was 75 cars; the actual sale was 100 cars, of which 80 were sold at retail by the Portland branch; 15 were sold by the dealer who remained in business, and 5 were sold by the dealer who went out before he gave up the agency. No other dealers had been secured at the end of 1921.

OREGON.—The distributor's branch had three dealers, two of whom went out in 1921 and one was secured to replace. The expected market was 110 cars. The actual sale was 100 cars, of which 50 were sold at retail by the branch; 25 were sold by the dealer who remained in business through the year; 15 were sold by the two dealers who went out and 10 by the dealer who came in to replace.

In order to maintain its position on the Pacific Coast, the Jones company must conduct the following business through their distributor:

CALIFORNIA.—	The present number of dealers	21
	Expected mortality	6
	New dealers to be secured	15
	Number of dealers required	30
	Total sales of cars in this price group for 1923	4,692
	Expected sale of Jones car for 1923	938
	Expected sale at retail by the distributor in San Francisco	300
	Cars to be sold through dealers	638
WASHINGTON.—	Present number of dealers	1
	Mortality (not figured)	
	Number of dealers required	2
	Total sales of cars in this price group for 1923	411
	Expected sale of Jones car	105
	Probable sale through branch	75
	Sale through dealers	30
OREGON.—	Number of dealers at the end of 1921	2
	Expected mortality	1
	Number required	3
	New dealers to be secured	2
	Total sales of cars of this price group for 1923	576
	Expected sale of Jones car	130
	Probable sale through branches	50
	Sales through dealers	80

In view of these facts it is necessary for the Jones Company to determine whether the present organization for distribution will be able to secure the number of sales to be expected from the market conditions. The weakness in the sales of 1921 through California and the large mortality in the dealer organization in that state must be overcome by better contact with dealers and through the effectiveness of the merchandising plans, and by intimate consideration with the distributor of the measures to be taken to overcome that weakness. The Jones Company, through all their territories, will need the same information in order to lay plans for the whole company on a broad basis that will have in mind strengthening the dealer organization in order to lessen the mortality and increase the stability of sale, developing the facts as to the dealer's position so that the arrangements and contracts will enable him to make a reasonable profit and assure him of

reasonable support. The considerations will involve all questions of service, contracts, used cars, and all the other problems connected with the retailing of the automobile in each individual case, but the country-wide program will be concerned with the problems of maintaining an intimate contact with the trade so that changes in agencies can be made without expensive interludes, losses of value through the character of the dealers, or other items. The contact should be so thoroughly established that the mortality will be lessened because a better class of dealers can be secured. Analysis should include the consideration of the means to be taken to increase the actual sales to the expected quota, the establishment of quotas in accordance with the expected sales, and the actual strength of the dealer organization in each locality, and matters of this kind. On the basis of such figures, a reasonable basis can be arrived at for all business with the trade and for all promotion to the trade.

The mortality statistics of the dealers should be compared with the general statistics of mortality for the year in the automotive field, so that the difference between the mortality shown by the Jones Company and the mortality of the general field can be considered as to its indication of weakness or strength in the Jones Company's distributing plan. For instance, if the mortality in the United States among car dealers for the year 1921 was about 50 per cent, the mortality as shown for California, Oregon and Washington is not out of the way and does not indicate any special weakness or any unusual strength in the distributing plans of the Jones Company. Other territories may show a larger mortality in which case the reasons for this increased mortality should be examined. In some territories the mortality may be less than the average, in which case the reasons for the particular strength should be determined.

The weakness in the Jones Company's distributing plan, as it stands at present, lies in the inability to secure a sufficient number of dealers to replace those that have gone out of business or given up the agency. The general statistics in the automotive field show that there were about as many car dealers at the end of the year as there were at the beginning of the year. In other words, new dealers come in or new people take on agencies in sufficient numbers to offset those going out. On the Pacific Coast, the Jones Company has not been able to secure a sufficient number of dealers to offset the mortality due to those actually going out or giving up car agencies and the consequence is that the number of distributing outlets is now considerably smaller than it was at the beginning of 1921.

The same comparison should be made for each territory so that the plans for sales and promotion activity in 1923 may be arranged to take care of these conditions and provide a proper number of the right kind of distributing outlets, before the quota is established for the Pacific Coast distributor by the Jones Company. The entire United States should be classified in the same way that these three States have been classified and measures to correct the weakness of sales should be determined so that they may be taken into account in dealing with the quota question and the other questions that will arise with this distributor.

It may be that the Jones Company will find the loss in the total number of dealers confined to this territory, and that in the other territories those dealers going out have been promptly replaced by others coming in. In that event, the particular weakness is local and additional pressure may be necessary from a local standpoint by a discussion of the distributor's plans of action and his methods of dealing with the retailers. On the other hand, if the same condition shows up in other territories, whether to the same extent or not, the general plans of action will necessarily include more pressure on the dealer population in the automotive field so that the Jones proposition may be thoroughly understood and a keener examination made of the proposition itself so that the company may be assured that it is of the right kind to attract the efficient dealer.

ALL questions of service, contracts, used cars and all other problems connected with the retailing of an automobile should be considered in each individual case, and the contact with the trade should be so thoroughly established that dealer mortality will be low due to securing a better class of dealers.

Analysis should include the consideration of the means to be taken to increase actual sales to the expected quota, the establishment of quotas in accordance with the expected sales and the actual strength of the dealer organization in each locality. On the basis of such figures, a reasonable basis can be arrived at for all business with the trade and for all promotion to the trade.

The whole question of sale depends upon the maintenance of the proper distributing outlets and the weakness of the Jones distribution in California is reflected in the failure of the sales to reach the expected number of cars. There is no evidence in the statistics that the sale will be more likely to reach the expected number in 1923 unless the dealers are sold more thoroughly on the value of the Jones proposition and the distributor is equipped to take proper care of them. More and more, the importance of adequate and stable distribution becomes visible; consequently, the Jones Company should collect statistics upon this point with the utmost care, at the same time determining the reasons for the strength and weakness that may show up in the different territories.

Italian Motor Car Taxes Reduced

UNDER a socialistic impulse the Italian Parliament some time ago passed a law imposing such a high tax on privately owned motor cars that the future of the industry was seriously threatened. A car rated at 10-15 hp. is taxed at $240, nominal exchange; 15-20 hp. at $450 and a six-cylinder 24-hp. car, $950. After two years' experience the Italian authorities have realized that high taxes are not only seriously handicapping the motor movement, but that they are less remunerative to the State than the more moderate taxes in force before the war. In consequence, a technical commission presided over by the Under-Secretary of Finance has decided on a reduction of 50 per cent on the motor taxes applied to small and medium-powered cars, as well as to motorcycles and motor-assisted bicycles. It is also proposed to abolish all taxes on electric cars for a period of five years, providing the vehicles are of Italian construction. There will be some reductions in the taxes on motor trucks, although these imposts have never been high compared with private cars. As an example, a 1½-ton truck is at present taxed only $65 per annum, while a private car of the same engine size pays $1,000.

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The AUTOMOBILE
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Exports Picking Up

STATISTICS pointing out the improvement that has been accorded to the automotive industry are always of interest and value. Consequently a good deal of satisfaction and assurance for the future may be obtained from the following figures as to the international business in American passenger cars during the month of February:

Shipped from the United States	3096
Shipped from Canada	2719
Ford assembly at Manchester, England (both cars and trucks)	2000
Ford assembly at Buenos Aires, Argentina (both cars and trucks)	1245

The total is 9050, a figure that has not been approached in our foreign trade for many months. It would be materially larger if the Ford assembly at Sao Paulo, Brazil; Cadiz, Spain; Bordeaux, France; Copenhagen and other cities were added. However, these statistics reveal United States and Canadian shipments of 5815 passenger cars, to which an additional business of 718 trucks were sold from the two countries. Going back into previous shipments, the last month with a comparable total was January, 1921, with 5249 passenger cars, and December, 1920, with 7753.

Stow the Hammer

THE entire automotive industry has suffered much from adverse rumors during the period of business depression. Many rumors have been founded on fact, but more have been started by persons speaking unthinkingly to those who assumed that the remarks were made in good faith. So it behooves us all to refrain from knocking when we do not know the facts.

It is the duty of a concern to be a credit to the community in which it is located and at the same time any concern which does conduct itself with credit deserves outspoken moral support. This applies to our competitors as well as ourselves, for the strength of the industry depends on the strength of the individual concerns. This may be carried to the ultimate point by saying that that which benefits the community benefits the nation as a whole.

In the days to come let us not forget that the industry needs an every-day application of the old adage: "Stow the Hammer and Sound the Horn."

Automatic Production

MOST industrial ills are the result of a failure to understand the fundamental processes of human and economic laws. Present necessities frequently loom up so large because of proximity that their true relative importance is obscured. The difficulties arising from this fact can be readily traced through the marketing, production and labor problems of the automotive industry.

The predominance of automatic machinery in modern industry, for example, has unquestionably reduced materially the necessity for individual skill and for individual responsibility on the part of the worker. This trend has produced increased efficiency in production up to a certain point. Consequently, many engineers are assuming that this efficiency will continue to increase in proportion as the development of automatic machinery progresses and the necessity for the exercise of individual judgment and responsibility grows constantly less.

A more comprehensive study of fundamentals, however, shows this theory to be a fallacy. There is a very definite point at which, even from the immediate production standpoint, the monotony and nervous fatigue of repetition work offset the increased efficiency gained by the worker in repetitive production processes.

Stepping outside of the individual shop, moreover, the effect of maximum development along present lines will be to slow down the mental process of the mass of individuals comprising our civilization to a point where the necessary leaders and foremen could be obtained, to where the lack of interest in the work in hand will be so great as to offset the production efficiency gained by repetitive work, and to where

industry and production will suffer from a gross inefficiency, unlike pre-machinery inefficiency in kind, but equal to it in degree. As the responsibility of the individual worker is decreased, the necessity for supervision increases.

The purpose of industry is to serve the individuals comprising the human race. It is fundamentally incorrect to assume that man is to serve industry. Procedure based upon this latter assumption, if persisted in long enough and spread over a wide enough area, can result only in revolt—gradual or sudden—according to the strength of the economic forces operating in opposition to human desires and necessities.

That factory will operate most economically over a long period of time which provides within its working program the best opportunity for individual mental and intellectual development among its employees.

Necessary Statistical Data

THE need for accurate statistical data in the automotive industry is greater than ever before. The thorough study of marketing costs and distribution methods which must take place calls for the compilation and segregation of data that has previously been considered unnecessary. Production schedules must be correlated with sales possibilities and a proper balance of all organization activities must be obtained. The necessity for a detailed analysis of many of these problems has come to the industry only recently.

Comprehensive statistical data can be provided only through the concerted efforts of all agencies within the industry. There should be a wide exchange of experiences and of the results of surveys. Marketing studies should be made by many companies and co-operation encouraged in correlating the results of such studies. The field is almost virgin and the necessary development along these lines will be much more rapid if experiences and data are freely exchanged. The result will be advantageous to individual companies as well as to the industry as a whole.

Valve Capacities

IN automobile engines the inlet and exhaust valves generally are of the same diameter and also have the same lift. Designers undoubtedly have been led to the use of equal sized valves by the advantages of interchangeability and to equality of lift by the consideration that the lift should be made as high as possible and still have substantially noiseless operation at maximum engine speed.

The question has sometimes come up in the past, especially in connection with racing engines, as to which should really have the greatest capacity, the inlet or the exhaust. Judging by practice when valve capacities are unequal, the impression has prevailed that the inlets should be the larger or have the largest capacity. Until recently there seems to have been no experimental data on this available to the public.

The problem is somewhat involved, as there are conflicting requirements. In a racing engine or other type which operates under nearly full load all the time, the size of the exhaust valve is limited by the ability to cool it effectively, and we therefore find cases where two exhaust valves are used per cylinder and only a single inlet valve, which might create the impression that the exhaust capacity should be larger than the inlet capacity. There is, of course, no use in making the exhaust valve so large that it cannot be cooled, but this difficulty can always be avoided by using dual and triple valves, and does not affect the question of the relative valve capacities required at all.

Some light has been thrown on the above question by experiments made at McCook Field and reported in a recent S. A. E. paper by S. D. Heron. The experimental engine had two inlet and two exhaust valves to the cylinder and could be operated with all four valves, with two inlet and one exhaust, with one inlet and two exhausts or with only a single inlet and exhaust. The inlet and exhaust valves were not of exactly equal diameter and lift but were not very much different. It is interesting to note that the engine developed considerably more power with two inlets and one exhaust valve working than with one inlet and two exhausts.

That such would be the case might be expected, for the reason that the charge has to be drawn into the cylinder under comparatively small pressure, while the bulk of the exhaust is forced out under a high one.

Further confirmation of this relationship was furnished by tests in which only a single valve of each type was used. This, of course, gave very small valve capacity in proportion to the size of the cylinder. One of the valves was 1⅜ in. and the other 1 9/16 in. in diameter, and the lifts were the same for both. With the bigger valve for the inlet the engine gave approximately 10 per cent more power than when that valve acted as the exhaust. Thus it seems to be established that for maximum power the inlet valve should always be larger than the exhaust valve; or, to express the matter in a somewhat different manner, if an engine has inlet and exhaust valves of substantially the same capacity or size, more can be gained in the way of power by increasing the inlet than by increasing the exhaust valve size.

Progressive Conservatism

THE upward trend of car and truck production is in itself sufficient to warrant considerable optimism as regards the automotive industry during 1922. But conversations with factory executives reveal an even more fundamental reason for predicting sound progress from now on.

Factory executives throughout the industry are speaking in conservative terms concerning immediate production and sales possibilities. They are not overconfident; they recognize the limitations of the present upward trend of business and are laying future plans on a sane, conservative basis. Predictions concerning production probabilities are being made on a conservative basis that indicates sound progress.

If this same conservativism that undoubtedly pervades the minds of automotive executives could be translated into the publicity statements sent out by the various concerns, public opinion would be molded more favorably toward the automotive industry.

Outlook Bright for Second Quarter

Volume of Business Likely to Increase

April Will Be Better Than March —May and June Probably Will Show Further Gains

By James Dalton

NEW YORK, April 11—The automotive industry enters the second quarter under decidedly encouraging auspices. Orders on hand, factory schedules established and orders given for supplies, make it certain that April will be as good as March, if not better. Parts makers already have received commitments which indicate that there will be no slackening in May. Prospects for June are good.

If sales continue at the present rate for another three months it would be surprising if there were not a mid-summer decline in business. Such a seasonal falling off has been perennial in the industry except for the last two years. There was none in 1921 and in 1920 it came in the second quarter.

Manufacturers and dealers are just beginning to realize how big a month March was. To find a parallel it is necessary to go back to March, 1920, which was one of the three or four best months the industry ever had. All carload shipment records since that time were broken last month. They were materially larger than in any month of 1921 when the highest total was in August with 20,350. Last month's total was approximately 25,000. The biggest month in 1920, after March with 29,326 was August with 23,386.

March production by Ford was more than 70,000 and it is expected to reach 100,000 this month. The other large makers showed a greater gain over February than did Ford.

One of the most encouraging incidents for the week in the whole industrial field was the reopening of the Ford assembly plant at Atlanta after being idle for a year. This step was justified by a 100 per cent increase over February in sales in the Southern States.

A conservative estimate of the volume of sales for the industry as a whole in 1922 would be something like the following:

Passenger cars: At least equal to 1921 and probably considerably in excess.

Light trucks: An increase of at least 200 per cent over 1921.

Heavy trucks: An increase of at least 100 per cent.

Tractors: An increase of at least 200 per cent.

Parts and accessories: An increase of at least 100 per cent and probably much more.

Tires: A considerable increase.

Business in Brief

NEW YORK, April 11—Confident forward steps have been taken in the last week by such basic industries as building and its related lines, iron and steel and agriculture. Retail trade has felt the impulse of spring. This has been reflected in jobbing and manufacturing lines.

A great boom in building continues. Expenditures in 109 principal cities for March were $194,661,072 as against $99,219,326 for February and $91,875,757 for March a year ago.

Bank clearance for the week ending April 6 aggregated $7,191,119,000, a gain of 16.8 per cent over the preceding week and of 11.3 per cent over the same week last year.

Pig iron production in March totaled 2,034,794 tons, compared with 1,629,991 tons in February. It was the first month since January, 1921, to pass the 2,000,000 mark. Orders for steel products as a whole have been heavier in the last two weeks than at any time since 1920.

Stocks continue buoyant, bonds higher, exchanges steady and time money slightly easier.

With favorable weather winter wheat has improved in all sections. Private estimates of yield are from 550,000,000 to 580,000,000 bushels. Prices in all grain markets showed gains for the week.

Official statements by 935 Iowa banks show that conditions have improved considerably.

Textiles have continued quiet in primary markets.

Car loadings for the week ending March 25 totaled 846,035 with 508,653 loaded with miscellaneous freight and merchandise. This was an increase of 10,996 over the preceding week for the same classes of freight and a gain of 61,956 for the same week of 1921.

Ford April Schedule Is Placed at 101,164

Will Exceed Last Year by 10,000 —Other Plants to Increase Production

DETROIT, April 10—The production schedule of the Ford Motor Co. for April closed with 101,164 cars and trucks, which will exceed last year's production by 10,000. An increase of 200 men daily has been made for two weeks at the Highland Park plant, and the employees now total nearly 40,000 men. Tractor production has reached 400 daily.

Ford officials say that the business now in sight will justifiy making 110,000 cars and trucks. The Canadian factory is expected to run at its capacity of 225 cars a day for the next three months.

General Motors, with a combined output of 66,000 cars for the first quarter, will materially increase production the second quarter.

The estimated production of Dodge Brothers for the second quarter is 52,000, or more than double the second quarter of 1921.

Hupp shows 6344 cars for the first quarter and expects to make 12,000 in the second, as against 4500 in the same period last year.

Packard made 2234 cars and trucks in the first three months of 1922 and expects to turn out 4000 in the second quarter, as against 2200 the same period last year.

Maxwell has a schedule of 200 a day, or a total of 15,000 for the second quarter, compared with sales of 4500 in the second quarter of 1921.

Willys-Overland is turning out 400 cars a day, or at the rate of about 30,000 for the second quarter, which will double the second quarter of 1921.

QUARTER'S OUTPUT, 207,560

NEW YORK, April 10—In the first quarter of 1922, with March partly estimated, members of the National Automobile Chamber of Commerce produced 207,560 cars and trucks, which was 220 per cent of the same period for 1921. All manufacturers reporting produced 371,798 cars and trucks in the first quarter, which was 162 per cent of the same period for 1921.

AUSTIN PAYS OFF RECEIVER

LONDON, March 27 (*by mail*)—Austin has just paid off the receiver and is now in a flourishing condition. Orders, exceptionally large in number, are coming in at a good rate, and last week's turnover was the best for 12 months.

Production Trend Steadily Upward

Indianapolis Plants Going Ahead Rapidly

March Reports from Manufacturers Indicate That February Was Far Surpassed

INDIANAPOLIS, April 7—There has been a sharp upturn in automotive manufacturing in Indianapolis during the last few weeks. Reports for March from a dozen representative manufacturers of cars, parts, accessories and engines show that March records far surpassed those of February, and in some cases ran ahead of the best early season records of last year.

Cole reports that February and March exceeded 1921 records by 50 per cent. March itself was far better than the same month last year, while its production and shipment figures exceeded those of February, 1922, by more than 100 per cent.

H. C. S. advises that January, February and March of this year doubled the records made last year, while April shipments apparently will be 100 per cent in excess of those of March.

Marmon's production and shipment figures for the early part of this year are double those of the 1921 period. March and April shipments are far ahead of the output for the same period last season. The present production monthly average is close to the maximum point reached last year, even when revised prices went into effect.

Stutz 20 Per Cent Ahead

Stutz's first quarter production and shipment were more than 20 per cent ahead of the same period last year. March, 1922, showed an increase of 50 per cent over February. April business is expected to keep up to March and probably pass it.

Lafayette's first buying spurt began at the New York show and the orders and consequent shipments have kept up. March business was better than the preceding months of this year. A higher schedule was put into effect thirty days ago.

Automotive Parts Co. reports that February and March business was up to the peak reached during the boom period. April will be the biggest month the concern has ever had, night shifts working at least three days a week.

Oakes Manufacturing Co. within the last three or four weeks has experienced a very sudden and large demand for its products. Production and shipment are now within one-third of the volume of boom times and far ahead of the same period last year. Nights shifts are also being operated.

Steady and Well Defined Flow in Buying Reached, With No Halt Apparent

By Charles D. Hastings

President of the Hupp Motor Car Corp.

Detroit, April 11.

UNLESS some unusual and totally unforseen economic condition arises in 1922 there is no reason why the automotive industry and business generally in the United States should not continue to progress toward a happy point of prosperity.

There is nothing unusual about the present business in the automotive field except, perhaps, that a certain amount of it is deferred business which ordinarily would have developed in 1921 but for the lack of firmness in the business structure generally.

Business is now on a more stable footing. Deflations have been accomplished. Buying which started on a light and scattering scale in the fall of 1921 has been extended gradually until now it has reached a well defined and steady flow. There is nothing which would indicate that this flow of business will be interrupted.

In the automobile field price stability is a real factor in stimulating demand. The marginal buyer who has to anticipate market conditions is convinced that present prices represent ultimate declines and is buying. Then, too, the improvement in business tone has caused those who withheld buying cars against a protracted business slump to come into the market.

Because of its general appeal, the automobile market is the first to ride on an incoming business wave and the last to fall in a decline. The rise of business from the decline of 1920 is definitely under way. With the marketing of crops this fall the period of prosperity for all business should be well under way.

Midwest Engine Co. reports a light production during January, which increased at least 12 per cent during February and an equal amount during March. April will show more than a 20 per cent increase over last year. New contracts on which delivery will start in a little more than a month have been received together with orders from old customers who are now buying more engines than in previous months.

Robert H. Hassler, Inc., states that production and sales for the first quarter were about 25 per cent beyond figures for last year. Except for seasonal fluctuations, the annual output has risen steadily during the last three years.

Wheeler Schebler February and March production shows a gain of 100 per cent over November and December, and April will show a further gain of 25 per cent.

Burpee Johnson shipment and production figures for the first quarter are 100 per cent better than last year.

SHALER WORK RESUMED

WAUPUN, WIS., April 10—Production of Shaler vulcanizers, headlight lenses and other automotive equipment and appliances by the C. A. Shaler Co. has been resumed in temporary quarters pending the completion of the new plant which will replace the group destroyed by fire early in March with a loss of nearly $300,000. Actual construction work on the new factory is already under way.

Durant Will Produce 200,000 Stars in 1923

Sample Cars To Be Turned Out This Month—Sales Plan Considered

NEW YORK, April 11—Durant Motors, Inc., has informed its stockholders that it has entered into contracts with the Star Motor Co. of New York, the Star Motor Co. of Michigan, and the Star Motor Co. of California to produce the Star car, which will sell at $348, in the divisional plants of Durant Motors and under the same management. The production schedule of the Star for the calendar year 1923 has been tentatively fixed at 200,000. The production schedule for Durant fours and sixes for next year has been placed at 80,000.

Detailed plans as to the sales policy for the Star probably will not be announced for two months. It is proposed to turn out 100 sample cars this month, 500 in March and 1000 in June. After that production will be increased as rapidly as possible so that deliveries to purchasers can begin.

When the sales plan is evolved it probably will call for the establishment of divisional factory branches which will have direct charge of sales in territories

(*Continued on page* 842)

Parts Makers Feel April Improvement

Consensus Is That It Will Probably Exceed March Which Was Good Month

NEW YORK, April 10—Following are paraphrases of reports made by credit representatives of some of the leading parts manufacturers at a recent group meeting at which business conditions were discussed:

"Our March business was the biggest we have had—bigger than in any month in 1921. We feel that April is going to be a great deal larger than March. We sell to a lot of people in the South, and of late they seem to be coming through. Our collections indicate there is going to be a big improvement down there."

"We, too, are very optimistic about the future. March was a very good month and I believe April is going to be still better."

"March was very encouraging to us. Our April business already scheduled also is very encouraging. As a matter of fact March and April are going to be the best months we have had in a year and a half."

Sees April Biggest Month

"Our business for February and March was very good and we expect April to be the biggest month we ever have had. We can't get material fast enough for automobile manufacturers."

"Each month this year our shipments to automobile manufacturers have shown a material gain over the preceding month. The orders we have booked indicate that April will be at least equal to March and May will be good too."

"April is going to be a very good month. In fact it probably will be bigger than we can handle. We have had a night force in some departments to take care of April specifications."

"We feel very good about the prospects for April and May."

"Since the first of the year our production has increased steadily, month by month. April will be as good as March if not better. We believe this condition is general and that we can expect a continuance for at least 60 days after which we expect the usual lull."

"I have sounded our New York banks and they are very optimistic as to the future, much more so than they have been in a long time. Trucks are being moved and in places where we thought we had frozen loans we find we are getting substantial reductions. Another gratifying feature seems to be that dealers are not being overloaded beyond their capacity to sell."

Improvement Steady

"Our business has shown a steady improvement every month this year. We are now running three days a week whereas for several months we have been running only two days. We have some orders for delivery in April and May."

"Our outlook for April is that we will have a better month by far than we did in March."

"April orders from our principal customers are much higher than for March. It has been our experience that we cannot get anything like adequate notice on shipping requirements. They simply won't order until they have sold. They won't buy until they have sold. This is common to all branches of the industry. We won't tie ourselves up for large quantities of material until we can see our way out."

"Our business is showing a steady improvement, nothing very startling but quite satisfactory nevertheless. The great trouble with our business is to keep a uniform manufacturing practice. We will get an order on a certain number of units today and tomorrow we may get a cancellation on a part of them. Automobile purchasing agents seem to be very much up in the air as to just what they will require and when they will require it. On the whole, however, we feel that we are going to have a very nice increase over the first six months of last year."

"We have been very much encouraged by our sales both to manufacturers and dealers."

"The automobile manufacturing end of our business was very good in March and April will be much better."

"The machine tool trade seems to be picking up. The truck industry also is improving and passenger cars are satisfactory."

Peerless Position Good Stockholders Are Told

CLEVELAND, April 10—In submitting to stockholders the annual report of the Peerless Truck & Motor Co., the following statement was made by President R. H. Collins:

Taking into consideration the general business depression, we feel that stockholders should be well satisfied with the showing and financial condition of the corporation. It will be the policy to continue to build and market one of the finest eight-cylinder cars, and the interest in our line, as reflected by actual sales since Jan. 1, is ample evidence of the excellence of our product and an indication that the country as a whole is gradually returning to normal conditions.

The recent declaration of the dividend for 1922 at the rate of $3 per share, your president feels, is fully justified by present prospects and the excellent financial condition of the corporation.

Republic Truck Division Will Solicit Rail Trade

DETROIT, April 7—Republic Motor Truck Co., Inc., has organized a public utilities division under Ralph M. Sparks, to merchandise the Republic Knight-motored bus. This department will devote itself exclusively toward merchandising the bus to railway lines which have a problem of feeder service to meet.

Sparks is a well known passenger transportation man, having been connected for a number of years with a prominent railway line in the East. The efforts of this division will be fortified by the factory sales department and the distributor organization.

EMPLOYMENT IS GREATER

WASHINGTON, April 10—A survey by the Federal Employment Service of conditions in the automotive industry for March showed an increase in employment of 8.4 per cent over February, with the addition of approximately 15,000 to payrolls during the month by the companies reporting. The survey indicates that there will be greater activity in April. The employment service declared that industry as a whole took up considerable slack in March.

Business Is Taking Long Upward Swing

Slow Progress in Milwaukee Encouraging to Manufacturers —No Sharp Setbacks

MILWAUKEE, April 10—A continuance of the progress made by the automotive industries in Milwaukee and vicinity during March, with respect to increased output, is reported in the first ten days of April. This is true as well of passenger car and motor truck factories as the makers of engines, frames, gears and other parts. The most favorable showing, however, is being made by the manufacturers of automotive equipment, who are getting good orders from the jobbing trade as the result of renewed buying interest among consumers being reflected into retailers' orders.

Although it would ordinarily be expected that slow progress makes a less satisfactory feeling than rapid advancement, representative men in the automotive industries locally are of the opinion that the gains now being established slowly furnish a most encouraging feature of the situation. Experience of the past year has shown that spurts are less substantial than the long upward swing, slow as it may be, they explain. The present trend has been unusual in that so far there have been no sharp setbacks, as before.

Local Trade Excellent

There is an extraordinary unanimity of opinion among distributors and dealers in this city relative to the comparative excellence of the state of retail business in this territory. Most dealers are able to say that they sold more passenger cars in March than in November, December, January and February put together. This March was a much better one for retail business than the corresponding month of 1921.

The improvement generally has been accentuated, in some instances rather sharply, in the past week. Better weather and more seasonable climatic conditions have contributed considerably to make this true.

On the other hand, the feeling is growing among owners that the bottom of the price decline not only has been reached, but may be subjected at any moment to a reversal. Consequently many of them are entering the market to take advantage of present prices on new cars and allowances being made on used vehicles. From 75 to 80 per cent of deals at this time involve trade-ins.

WHEEL MAKER BUYS PLANT

WOOSTER, OHIO, April 11 — The Pneumatic Disk Wheel Co. of Richmond, Va., has purchased the Wooster plant of the Kelley-Springfield Tire Co., the consideration being $150,000. The plant, which has been closed for some time, will be reopened July 1, and disk wheels for automobiles will be manufactured.

DuPont Expresses Confidence in 1922

Tells Stockholders That Year Had Auspicious Opening for the Industry

NEW YORK, April 11—"The officers of General Motors Corp. believe that recovery from the depression of 1921 is reasonably assured and look forward with greatest confidence to a successful business in 1922."

This optimistic statement is the closing paragraph of a communication addressed to the stockholders by President Pierre S. duPont in submitting to them the final report of the corporation for the fiscal year ended Dec. 31. In his statement duPont says:

Industry Passes Test

Last year occasion was taken to call attention to the rapid growth of the automobile industry and to compare the volume of sales for the year 1920 with the annual sales of other important products. At that time the country was on the eve of a period of depression and liquidation, the extent of which was beyond accurate prediction. The importance and stability of the automobile industry during such periods had not been tested, therefore the outcome of business for the year 1921 was looked upon with confidence, doubt or apprehension, according to the viewpoint of the individual making the forecast. It must be conceded that the industry as a whole has withstood the test remarkably well.

In the first place, the increase of registrations of automotive vehicles from 9,211,295 in 1920 to about 10,488,000 in 1921 (an increase of 13 per cent) shows that the generally depressed conditions did not result in disuse of the automobile as a means of transportation. In fact, the number of cars in use actually increased in a period of rapidly declining values, unemployment and general business depression. Secondly, the value of automobiles produced, which stood at $2,233,000,000 in the banner year of 1920, decreased in 1921 to an estimated $1,222,000,000, or a decline of about 45 per cent. Thirdly, the number of cars and trucks produced fell from 2,205,000 to 1,680,000, or about 24 per cent. Fourthly, the domestic consumption of gasoline for 1921 as reported by the Bureau of Mines was 4,506,706,000 gallons, an increase of 6 per cent over 1920.

The above facts emphasize the importance of the automobile and establish the automotive industry as a permanently important factor in the country's development and activities.

Position in Market Satisfactory

General Motors Corporation has held its share of business with respect to the medium and high-grade cars. As a whole, its proportionate volume is slightly less, due to the fact that it is not as large a producer of low-priced cars as those of high and medium grade. The low-price field has naturally been the most active in depressed times; therefore, it is not surprising that General Motors Corporation shows a slight falling off from the average of the industry. However, its maintenance of position in the field is considered satisfactory.

Sales of passenger cars, commercial cars and tractors for the year 1921 totaled 214,799, compared with 387,190 in 1920; 406,158 in 1919; 246,834 in 1918, and 324,503 in 1917.

During the year 1921 it became apparent to the executive committee that the operations of certain divisions were in conflict with newly formulated plans for conducting the business of the corporation. Consequent changes and the reorganization of these divisions on the lines established have resulted in loss, not only in profits, but also through liquidation and scrapping of inventories and the abandonment of car, truck and tractor models not suited to the adopted rules for quality and performance. Some of these changes have been radical, but the executive committee has faced the reorganization without fear and in full confidence that the future would thoroughly justify the complete readjustment of unsatisfactory conditions.

Divisions Closely Knitted

It has been the effort of the officers of the corporation to knit more closely its different divisions in order that the greatest benefit might result from the co-operative conduct of this large business. Much is left to be done, but the foundation for closer co-operation has been laid and benefits are already accruing. Systematic study has been given to the relations of the several divisions to each other and duplication or conflict of effort has been avoided. As a whole, much has been accomplished and many plans laid that will develop to the future advantage of the corporation.

In the last annual report attention was called to the large accumulation of inventories toward the end of the year 1920 and the liquidation that had been accomplished on Jan. 1, 1921. This liquidation has gone steadily forward, so that inventories have been reduced from $164,684,000 to $108,762,000 (a reduction of $55,922,000) during a period of comparatively small sales volume. This liquidation has been accompanied by reduction in payables as follows:

Current accounts payable have been reduced	$9,702,000
Notes payable have been reduced	23,446,000
Total reduction in current indebtedness	$33,148,000

The outstanding feature in the report of operations for the year 1921 is liquidation—liquidation forced by the sudden contraction of business to an abnormally low level throughout the United States, in face of declining values. The accomplishment of this liquidation in orderly manner is a tribute to American industry and the officers and employees of General Motors Corporation are to be commended for their effective work in the liquidating program. The corporation met the shock of abnormal retrenchment and stood it well.

The outlook is now brighter. The year 1922 opens with inventory accounts reduced to current basis and old commitments provided for or adjusted. The opening months of the year show substantial increase in demand and sales, not only with respect to corresponding months of 1921, when business was nearly at a standstill, but also as to several of our divisions even in comparison with the record year of 1920.

The officers of General Motors Corporation believe that recovery from the depression of 1921 is reasonably assured and look forward with greatest confidence to a successful business year in 1922.

MAIBOHM PLAN ADVANCES

TOLEDO, April 9—With only three more creditors to assent to the reorganization plan proposed for Maibohm Motors Co., Sandusky, it is believed the plan for Sandusky capital to take over the plant there will be approved in a few days.

Akron Tire Output Has Reached Normal

Factories, However, Are Not Running Full Blast—Goodyear Still Leads

AKRON, April 8—Tire production in Akron to-day is at the rate of 22,500,000 casings and 25,000,000 tubes a year.

Figures of the Rubber Association of America show slightly over 21,000,000 tires manufactured in the United States in 1921, Akron making more than 16,000,000 of that number. If this same proportion of tire production holds good for the entire year, based on Akron's estimated tire production, there will be close to 35,000,000 American tires built in 1922.

Daily Output 73,000

A census of Akron tire companies shows the following present production tickets: Goodyear, 22,000 a day; Firestone, 21,000; Goodrich, 14,000; Miller, 6000; General, 2000; Seiberling, 2000; all others, 8000.

The Seiberling production includes the local plant and the Lehigh plant at New Castle, Pa.

Figuring normal tire production in Akron at about 75 per cent of the peak of production of 1920, for there has not been a normal year in Akron upon which to base comparisons, then Akron's tire production to-day is normal. This does not mean, however, that the factories are running at full blast. Although Goodyear heads the list with 22,000 casings a day, Firestone becomes the virtual leader in proportion of peak output now being obtained, for whereas Goodyear's peak was 33,500 tires daily, Firestone's peak was 28,000.

All companies report heavier tube production. Goodrich is making between 18,000 and 19,000 tubes. Other companies show not quite so large a ratio of tube production, although it exceeds casing production.

Firestone has increased production 5000 tires a day within the past five weeks. Goodyear has increased from 18,000 tires at the beginning of the year.

General Doubles Production

General Tire is turning out twice as many tires as ever before in its history, and reports sales to-day more than 65 per cent greater than ever before. General will reach a basis of over 2000 tires daily by April 15. This will include daily production of 1000 special small sized tires.

The new Seiberling company is gaining production of Seiberling cords at the rate of 44 a day. Portage tire production at New Castle is approaching the thousand mark daily, while Seiberling cord production at Barberton exceeds 1000 a day. By June 1 the company expects to have a production of nearly 5000 tires daily. Orders are far in excess of production on Seiberling cords, it is reported.

Truck tire orders are getting heavier.

Stockholders to Act on Overland Plans

Meeting Called to Consider Bond Issue and Sale of Certain Holdings

TOLEDO, April 9—The plans of the Willys-Overland Co., relative to the sale of its assets, which are represented by securities in affiliated companies and property not needed in the actual conduct of the business of the company, will be presented to preferred stockholders at a special meeting called for April 24, to be held at the Administration Building here.

The preferred stockholders at this time will also consider the approval of the plan to issue $17,500,000 bonds or secured notes at 7 per cent to pay off bank loans which have been extended from time to time for more than a year.

The bonds would mature Dec. 1, 1923. Whenever stocks in affiliated companies and real estate pledged by the company under the terms of the bond security may be sold the proceeds are to be applied to reducing the outstanding bonds.

To Scale Down Plow Securities

In order to protect the interest of Willys-Overland in the Moline Plow Co., control of the common stock of which is held by the Overland, the preferred stockholders have been asked for written assent to a reorganization of the Moline Plow Co. by which its securities would be scaled down.

The Toledo directors of the Overland point out that this is the only hope for the Moline Plow Co. and the only way to keep it out of the courts. With the betterment in the agricultural machinery outlook and reorganization it is hoped to put the stock back to a basis where it may be sold. Consent of 75 per cent of the Willys-Overland preferred stockholders is necessary to permit the reorganization plan. Creditors of the company have agreed to the plan.

Notwithstanding the apparently poor showing in the annual report, most Toledo business men and bankers feel that Willys-Overland is in a very much better position to-day and that with the increase of sales and activity in the plant the losses of last year will be made up within a few years.

The plant here has been unable to get sufficient help the last week and has had to advertise in newspapers in all parts of the country for workers in the paint shop, woodworkers, body builders and trimmers. More than a dozen trades in these departments are short of men.

The annual stockholders' meeting has been announced for May 9, at the Administration Building. Election of directors will be the principal business of the meeting. Stock transfer books close April 27.

CURTIS R. HATHAWAY DIES

BOSTON, MASS., April 10 — Announcement is made of the death at Pinehurst, N. C., of Curtis R. Hathaway, one of the organizers of the General Motors Corp. and of the Chevrolet Motor Co. He was sixty-three years old. Hathaway was born in Suffield, Conn. After his graduation from Amherst, he was a law student at Columbia University. He then became treasurer of General Motors, but retired in 1909 on account of ill health. Two years later, however, he became associated with Chevrolet.

Stark-Inland Assets Sold to New Company

ST. LOUIS, April 7—The Inland Products Co., a new corporation organized under the laws of Missouri and capitalized at $500,000, has purchased the assets of the Stark-Inland Machine Works, manufacturer of piston rings and other automotive products.

Clyde C. Miner has been elected president and general manager. Under his management, it is expected that other products eventually will be added to the company's lines.

The company plans to erect a new factory which will be ready for occupancy within 90 days and will afford ample capacity to take care of the anticipated increase in production and sales.

Link Belt Sues G. M. C. Charging Broken Contract

WILMINGTON, DEL., April 10 — Claiming that the General Motors Corp. violated its contract, the Link Belt Co., an Illinois corporation, has brought an action in the United States District Court here asking damages of more than $1,250,000.

It is charged that General Motors contracted with Link Belt for the manufacture of certain parts for the Samson tractor, but that before the contract was completed the design of the tractor was changed so that the special parts were no longer required. General Motors, therefore, it is stated, canceled the contract.

Link Belt claims to have erected special machinery to produce the parts.

OVERLAND MEETING CALLED

TOLEDO, April 10—A special meeting of the stockholders of the Willys-Overland Co. has been called for April 24 in this city, to take action on a proposal to issue $17,500,000 in notes or bonds to mature not later than Dec. 1, 1923. Proceeds of the sale of new securities will be used to liquidate bank loans and provide new working capital.

TIRE RECEIVER REMAINS

ST. LOUIS, April 8—The motion of several stockholders, one creditor and the two receivers appointed by the Clayton Circuit Court for the Surety Tire & Rubber Co. for the removal of the receiver appointed in Federal bankruptcy proceedings, was overruled by United States District Judge Faris.

New Working Funds Provided National

Petition for Receivership Withdrawn—Concern in Strong Position, Officials Say

INDIANAPOLIS, April 7—Coincident with the withdrawal of the receivership suit brought against the National Motor Car & Vehicle Corp., George M. Dickson, president, and M. E. Elstun, secretary-treasurer, announced the successful completion of the refinancing plans started some time ago by which the corporation receives more than $450,000 of new working capital. This, together with the balance of the $750,000 bond issue authorized by the stockholders, which has not yet been used in its entirety, places the concern in a strong position, according to the officials.

The officers say that the new capital, plus the balance of the bond issue which will become available at a later date, will enable the company to take advantage of the increased demand for its products which the revival in buying has brought. Increased factory production will go into effect at once.

Suit Was Misunderstanding

The suit for the appointment of a receiver instituted by an indemnity company on behalf of the claim of the Columbia Axle Co., was never heard in court. The action has been withdrawn on behalf of the plaintiff, which originally informed the indemnity concern, before the filing of the case, to delay action until plans then under way for the satisfaction of the claim were worked out. The day before the suit was filed a representative of the parts company had been in Indianapolis and reached what was considered a satisfactory settlement with the automobile company. Acting contrary to instructions that it is said had been given it, the indemnity concern started the action the next day.

The elimination of this suit and the new working capital the National now receives places the institution in a position to progress as it has done through a long period. National is one of the pioneers of the industry and exhibited in the first Madison Square Garden show.

Adria Reorganization Returns Old Officials

BATAVIA, N. Y., April 10—Another reorganization of the Adria Motor Car Corp. has been brought about under which Louis M. Vremsak again becomes president and Willard C. Wheeler, treasurer, displacing Timothy J. Dailey and his son, Harry. Alexander Gray of Ontario, who once was secretary of the corporation, also has returned to Batavia.

Most of the 600 stockholders in the company live in this vicinity. When the Daileys took charge of the plant, it was understood they were to pay the creditors and get the factory in operation.

Merger Will Include More Tool Companies

Manufacturers Aim for Stabilization—To Centralize Selling Organization

CLEVELAND, April 11—Merger of the larger machine tool manufacturers of the United States has been enlarged, since the first announcement of the project, to include the Colburn Machine Tool Co., Cleveland; Lodge & Shipley Machine Tool Co., Carlton Machine Tool Co., Newton Machine Tool Works, Betts Machine Co., Hilles & Jones Co., and the Dale Machinery Co.

"This is without doubt the largest merger of machinery manufacturing concerns that has ever been effected," said H. W. Breckenridge, vice-president and general manager of the Cleveland concern. He also said that the uniting of these organizations would effect a great stabilization of the machine tool industry of the country.

The selling organization of the corporation will be centralized with offices in New York.

"The new corporation will receive the advantage of keeping the present management of the plants instead of breaking in new men for the work," said Breckenridge. The present personnel of each plant will be retained.

The capitalization will be placed at $35,000,000, all stockholders of the subsidiary companies turning in their stock and receiving in return its value in stock of the larger corporation.

F. Handley Page States German "Gotha" Was Copy

LONDON, March 31 (By Mail)—The Handley Page Co. has a claim before the Commissioners on Inventors' Awards concerning the "O" and "V" type of biplane as made by others during the war, by direction of the war-time authorities.

F. Handley Page, managing director of the company, testified in connection with the claim that the German "Gotha" was a copy of his machine and until the Germans captured a Handley Page, all complete, and were able to fly with it, they were not conversant with the structural details or convinced of the aerial dynamics in regard to big machines.

Two Directors Added to Kelly Truck Board

SPRINGFIELD, OHIO, April 11—R. J. Westcott, president of the Westcott Motor Car Co. and treasurer of the American Seeding Machine Co., has been elected a director of the Kelly-Springfield Motor Truck Co. to succeed J. B. Cartmell, who resigned owing to increased business in banking circles. Westcott is also a director of the Citizens' National Bank and was formerly mayor of Springfield. Alfred G. Hare, senior member of Hare & Chase, Philadelphia, succeeds Emlen F. Hare as a director.

James M. McCarthy of Quebec, capitalist and engineer, has been elected vice-president, the anticipation being that the election will result in a closer affiliation with Canadian business men.

Charles M. Young, president of the company, was present at the meeting of the board when the elections took place, as was James L. Geddes, chairman of the board, who is recovering from a long illness.

An excellent outlook is reported at the factory, the company having enjoyed the largest business last month than at any time for more than a year. The force is being augmented by the addition of skilled workmen.

Trustee Handles Parenti for Creditors' Benefit

BUFFALO, April 10—The affairs of the Parenti Motor Corp. have been placed in the hands of the Marine Trust Co. as trustee, for the benefit of creditors. The corporation has 11,000 stockholders here and in near-by cities.

Albert M. Saperston, representing the trust company, said it had not been decided whether the business would be continued or liquidated. Liabilities, he said, were approximately $200,000 and assets $400,000. The assets include a new factory and considerable raw material, but there is no cash in the treasury.

"The statement of the company shows it to be absolutely without funds," says a statement issued by the trust company.

The Parenti company was organized three years ago. An extensive stock-selling campaign marked the first two years of its existence. About 100 cars have been made, chiefly for demonstration purposes in connection with stock sales.

Buell Will Liquidate Assets of Sandow Truck

CHICAGO, April 8—Under an agreement with creditors, Edward D. Buell has been appointed as trustee to liquidate the assets of the Sandow Motor Truck Co. Buell estimates that the total liabilities, including $164,000 indebtedness to banks, will amount to $207,000.

The bank creditors have agreed to wait until the general creditors have received 50 cents on the dollar before they participate in the proceeds of any of the assets, except those pledged to secure bank loans. The physical assets of the plant will be sold at auction April 14. The trustee expects that all creditors, including the banks, will realize about 50 cents on the dollar.

RUBBER, CHINA CLAY FOR ROADS

LONDON, March 28 (*by mail*)—Experiments have been made testing the value of a compound of rubber and china clay for road surfaces. The tests promise well and, pending final trials, several rubber companies are considering the advisability of erecting plants to supply the material.

G.M.C. Acquires New Factory in England

Business Growth Leads to Occupancy of Grahame-White Plant in London

LONDON, March 31 (*by mail*)—The intentions of General Motors, Ltd., the English subsidiary of General Motors Corp., to consolidate assembly here, have culminated in the acquisition of the Grahame-White aircraft factory at Hendon, London, N. W. All G. M. C. passenger cars are now being imported from Canada in partially disassembled condition are to be finally assembled, tested and distributed from the Hendon plant, except Cadillac cars and G. M. C. trucks, which are still imported from the United States.

The company's new plant has approximately 35,000 sq. ft. of floor space, with three assembly lines already organized and two more contemplated. Spare parts to the value of more than $500,000 have been transferred from the Thurloe Street property previously occupied.

The company's decision as to the price of its assembled cars, notably the Chevrolet which at £260 is the only serious competitor here with the Ford, will be awaited with great interest, the more so as many dealers are perplexed over the Ford company's recent action regarding price reductions with no allowances to dealers on cars in stock and acquired at the old price.

Trade Exceeds Expectations

NEW YORK, April 10—In confirming the acquisition of the Grahame-White plant, officials of General Motors here declared that their present business in the British Isles was much in excess of what had been expected only a few months ago. Actual shipments to England made in March from the Canadian plant totaled more than 1000 cars, this showing a very large gain over the previous month.

Attention was called by the officials to the fact that the plant will not be used for complete assembly, in the same sense as this describes the Ford operations at Manchester. Completed cars or chassis will continue to be shipped from the Canadian plant and these will be uncrated, reassembled and made ready for operation at Hendon. Chassis, in some cases, will be fitted with special bodies made in England or to suit local needs. The plant will supply only the British Isles.

The cars being shipped from Canada are the Chevrolet, Buick, Oakland and Oldsmobile. This is in line with the recent decision of the corporation to supply export orders on these lines to practically all parts of the world from Oshawa.

The announcement was made that A. N. Lawrence, director of sales of the English company, is now visiting the United States to look over General Motors plants.

Ford Car and Truck Have Many Changes

New Type of Headlamp Is Important Feature—Mechanical Alterations Are Made

DETROIT, April 8—A number of detailed mechanical changes and refinements have been made recently on both Ford cars and trucks. The most important is the use of a new Type H headlamp for both cars and trucks, and for replacement on cars already in use. The lamp is equipped with a special design refracting type lens and a new 21 candlepower gas filled double filament bulb. The new lamps when properly adjusted are legal in all states, although there is great increase in road illumination.

Interior Finish Changed

The closed models are now being finished in walnut brown broadcloth, the seats being upholstered in the same material with a chalked ebony stripe. Heavy floor rugs are provided, and special design lifts have reduced the effort necessary in raising the windows. Door bumpers insure tighter fitting, and new door grips inside and out add to the convenience.

Mechanical changes are as follows:

The pistons and connecting rods have been redesigned and matched for weight before assembling to reduce vibration and give quicker pick-up. The new pistons are ¾ lb. lighter than the old.

The crankshaft surfaces are highly polished to reduce wear and make for smoother running.

A new carbureter gives increased acceleration with quicker pick-up and greater flexibility.

The wiring system has been completely redesigned, and all wiring is in loom where necessary to comply with underwriters' insurance rules.

Steering Wheel Additions

A 16-in. steering wheel is now regularly fitted and a steering wheel stop limits the travel of the steering wheel between the positions in which the front wheel spindles strike the front axle yokes. The full steering wheel motion is always effective in turning the front wheels, and the stop prevents straining or buckling the steering mechanism after the front wheels have reached the limit of their travel. Improvement has been made in the steering mechanism itself by the use of a taper construction on the steering ball bolt. The tapered bolt fitting into a special tapered seat in the steering connecting rod yoke provides a construction initially tight and prevents looseness and rattling in service.

Timken roller bearings are now used on models with demountable rims.

The radiator is now spring mounted and the fastening of the front radius rods has been improved by the use of tapered nuts in tapered seats.

The crankcase front end bearing has been redesigned, making it simpler and at the same time providing greater flexibility for the front spring. The new spring hangers are in one piece to maintain permanent alignment.

A new design cut-out is mounted directly on the generator.

The running-board brackets are of one piece, pressed steel, and make for body rigidity.

A dash weather trough prevents rain from reaching the coil terminals or the dash wiring.

Cord tires have been adopted as standard equipment on the rear wheels of the truck chassis.

A new spare tire carrier combines light weight with increased strength and rigidity.

In the equipment is to be noted a new license plate carrier, which will fit the tags of all states, a new jack and a new tire pump.

Essex Improves Design in New Phaeton Model

DETROIT, April 10—Several improvements have been made in the design of the Essex phaeton. The body is entirely new, being longer and wider. Body doors are wider and are hinged at the front. They now have inside as well as outside door handles, and the front pockets are enlarged to accommodate the improved storm curtains. The price is $1,095.

A new windshield, with a more handily operated top glass and forged side supports, is used. The shield and tops are both lowered. The head room remains unchanged, however, because the cushions are lowered and the general seating position is modified. A nickel robe rail is provided in the tonneau. Fenders of a new style, fully crowned and harmonizing with the general lines, are used.

Chassis changes include the adaption of a round gasoline tank, new type gasoline gage and carriers for a single tire. All new cars are equipped with the new type chassis oilers that replace the former grease cups.

NEW CLYDESDALE TRUCK

CLYDE, OHIO, April 8—The Clydesdale Motor Truck Co. is bringing out an all-steel truck which has a total capacity of 6850 lb., including the weight of the chassis, which is 3100 lb. This gives a carrying capacity of body and load of 3850 lb. The price is $1,485, which includes the starting and lighting system.

RAILWAY ASKS FOR BIDS

CHICAGO, April 10—The Southern Pacific Railway Co. has asked for bids on the construction of 2000 single sheated steel super-structure automobile cars of 50 tons capacity to be used on its system. These cars, which will be of the most modern type, will be equipped with double swing end doors and staggered side doors. The order is the largest ever placed by a Western road for this class of equipment.

Re-organization Plan for Earl Is Accepted

Lines of Credit Arranged—Company Has Orders on Hand for 2,500 Cars

DETROIT, April 12—Earl Motors, Inc., will begin a production schedule of 50 cars daily following the completion of its financial program, declared operative by banking interests this week in Chicago. The company declares it has orders on hand for 2500, to meet which it will employ a night shift starting immediately. Under the readjustment there is practically no current indebtedness. Sufficient funds are provided to permit capacity operation.

All important creditors of Earl Motors which became involved in the difficulties of the Fort Dearborn banks in Chicago have assented to the reorganization plan and have assigned their claims to the committee. Lines of credit have been arranged with Chicago, New York and Jackson banks.

Clarence A. Earl will continue as president of the company, devoting particular attention to the development of the sales organization.

George C. Scobie, recently with the Hayes Wheel Co. and formerly with Price, Waterhouse & Co., has been elected vice-president and comptroller and will have charge of the company's financial affairs. Other officers are Walter Mery, vice-president, and L. S. Westcoat, treasurer.

The banking interests and manufacturing creditors are largely represented among the new board of directors which has been elected. A sufficient amount of common and preferred stock has been pledged for deposit in a voting trust to assure the continuance of a directorate which is made up as follows:

Rumsey W. Scott, vice-president of the Chemical National Bank, New York; John O'Leary, vice-president of the Chicago Title & Trust Co.; J. E. Farrell, vice-president and treasurer of the Sinclair Refining Co., New York; William Sparks, president of the Sparks Withington Co., Jackson; Frank Joyce, vice-president of the American Auto Trimming Co., Detroit; Earl, Scobie and Westcoat.

Chassis of Overland 4 Redesigned for Trucks

TOLEDO, April 10—An Overland Four chassis, redesigned for truck use, has been brought out by the Willys-Overland Co. and will sell for $450 f.o.b. Toledo.

The truck chassis differs from the passenger car chassis in that it has heavier axles, stronger rear springs and a round gasoline tank mounted directly above the dash. The tank has been placed in this position to permit use of standardized types of truck bodies designed by various manufacturers for 100-in. wheelbase chassis.

Lincoln Motors Case Rouses Congressman

Impeachment Threatened Attorney General—Claim Results from War Contracts

WASHINGTON, April 11—Threatening the impeachment of Attorney General Daugherty for his "failure to prosecute the case of the Government against the Lincoln Motor Company," Congressman Roy O. Woodruff, of Bay City, Mich., Republican, to-day made a sharp attack upon the War Department, Department of Justice and former Attorney General A. Mitchell Palmer.

The Attorney General's failure to investigate contracts made with the War Department, Woodruff charged, has resulted in defrauding the Government out of millions of dollars. He said:

Charges Big Overpayment

The Lincoln Motor Company during the war received large contracts for the air service, and has been shown by the Government audit to have been overpaid to the extent of $9,188,561.90.

This concern some time ago was thrown into the hands of a receiver. The receiver has sold this property to Henry Ford for $8,000,000 cash which the receiver now holds.

This case had been turned over to the Department of Justice and by it referred to the District Attorney at Detroit for necessary action and suit had been started in the United States District Court against the receivers of the Lincoln Motor Company.

"We find the policy pursued in the past in some other cases, now being pursued by the Department of Justice in the case of the Lincoln Motor Company," Woodruff said, declaring that the case of the Lincoln company "has been taken out of the hands of the District Attorney at Detroit and has been returned to the Department here."

A new hearing is to be granted the Lincoln Motor Company, which will begin here to-morrow, and the speaker declared that unless the Attorney General "attended the hearing and represented the Government in the prosecution of the case," he would seek his impeachment for misfeasance of office.

The speech of Woodruff came in the nature of an appeal for support of a resolution which he introduced, preceding his speech, asking for the appointment of a select committee of Congress to investigate the Lincoln Motor contracts and all other contracts and expenditures made by the War Department, Navy Department, Alien Property Custodian and their departments during the war.

Involves Weeks in Bosch Sale

Woodruff also charged, in effect, that Secretary of War Weeks had been involved in the sale of the Bosch Magneto Co. and that Martin E. Kern, the original purchaser, had advised his agent to "take Weeks to Daugherty and put a quietus on this thing," meaning the proposed prosecution of the Department of Justice to set aside the sale of the German concern.

It was asserted by Weeks that the firm of Hornblower & Weeks, of which Secretary of War Weeks formerly was a member, has sold the bonds and figured in the rehabilitation of the American Bosch Magneto Corp. with a profit of $1,000,000 on the transaction.

Woodruff continued to say:

On December 31, 1918, nearly two months after the armistice, the capital stock of the Bosch Magneto Company was sold by the Alien Property Custodian to one Martin E. Kern for $4,150,000.

Kern was a close personal friend and client of Palmer, Alien Property Custodian at the time of the sale. It appears that Kern was not an American citizen, but was apparently of German birth and citizenship. It would also seem that he had served three terms in prison in the State of New York for felonies committed by him, and I hold here in my hand copies of his photograph appearing in the Rogues' Gallery in New York City. Apart from the fact, which seems to be admitted that Kern was not an American citizen, his conviction of a felony would deprive him of his civil rights and it does not appear that through pardon or other executive clemency such rights have ever been restored.

The trading with the enemy act, under the provisions of which the property was seized and subsequently sold, prohibits the sale of property to other than American citizens.

Following the introduction of Woodruff's resolution, it was referred to the Special Committee on Rules, who is expected to make an early report on it. Chances of the resolution being adopted and the appointment of a special committee to investigate all war-time contracts are reported favorable.

Daugherty Will Investigate

WASHINGTON, April 13—It was announced to-day at the Department of Justice that Attorney General Daugherty will personally investigate the war contracts of the Lincoln Motor Co. He will return here Friday and has ordered that the inquiry be postponed until 3 p.m. that afternoon so he can preside.

Before leaving Washington Sunday night, Daugherty made arrangements for a full hearing on the Lincoln contract before a court composed of Assistant Attorney General Goff and two assistants with attorneys for the receiver of the motor company. It has been planned that all interested parties shall be given opportunity to present their arguments.

ARABIC DEPICTS CAR

TOLEDO, April 10—What is said to be the first automobile instruction book to be printed in Arabic has been received by the Willys-Overland Co. at Toledo, from its dealer, Mr. Loukaitis at Cairo, Egypt. The book is illustrated with views of the engine and chassis and charts of the various mechanical operations that go to make up an automobile.

Senate Bill Retains Duties House Levied

Increases Taxable Automotive Products—Places Imports on Foreign Valuation Basis

WASHINGTON, April 11—The 25 per centum ad valorem duty, as carried in the House bill, has been approved by the Senate Finance Committee, in its report to the Senate on automobiles, automobile bodies, automobile chassis, motorcycles and parts of the foregoing, whether finished or unfinished. The committee revised the House paragraph by adding motorcycles and including "finished and unfinished automotive products." Furthermore, it struck out the clause in the House bill which would assess an additional duty on countries where customs discriminated against American automotive manufacturers.

The 30 per cent ad valorem rate on airplanes, hydroplanes, motor boats and parts in the House bill was retained by the committee.

Flexible Tariff Provided

The fact that the Senate bill places ad valorem duty on a foreign valuation basis as contrasted with the American valuation basis carried in the House bill, makes the bill a far different measure than when it came from the House, and it may be expected that this feature will be the object of a vigorous contest between the House and the Senate before the measure finally is enacted into law. There are clauses connected with the Senate bill, however, which call for flexible tariffs or a different basis of assessing duties, and these may lessen the differences between the two branches of Congress. In many instances the Senate bill, being based on a foreign valuation basis, carries higher ad valorem duties than the House bill. The increases are estimated from 30 to 50 per cent.

Financing Association Reduces Its Annual Dues

NEW YORK, April 10—The Automobile Financing Creditmen's Association has decided to reduce its dues to $10 a month with an additional charge of three cents for each serial number card filed. These cards contain the serial number of automobiles financed, and when the card is filed with the association the first step taken is to determine whether any other member of the association has financed the same car. If this is found to be the case, both companies are notified immediately. The maximum charge against any member for membership is limited to $500 a year.

It also has been decided that where finance companies at a distance of more than 150 miles from New York form a local organization, the New York association will permit the local, if consisting of six or more members, to join it as a single member with all membership privileges except the right to vote.

Men of the Industry and What They Are Doing

Resigns Schrader Presidency

M. Charles Schweinert has resigned as president of A. Schrader's Sons, Inc., of Brooklyn, after a service of more than 35 years with the company as general manager, treasurer, director and president. Because of his wide knowledge of the business and his engineering skill, he has been retained by the corporation in an advisory capacity. Henry P. Kraft, vice-president and treasurer, who has been associated with the Schrader company for the past 39 years, will succeed Schweinert as president. The Schrader company has been in business since 1844 and in recent years has become a large manufacturer of automobile accessories. Schweinert will devote much of his time to looking after his personal interests.

Cole Returns From Europe

J. J. Cole, president of the Cole Motor Car Co. of Indianapolis, has returned from an extended pleasure trip to Europe where he visited most of the large cities. He says that American built cars are seen everywhere in Europe and he believes that talk about the superiority of European built cars is unfounded except as it relates to the care and hand work put on custom built bodies.

Sutherland With L. F. Benton Co.

R. W. Sutherland, former general manager of the Splitdorf Electric Co., has been elected vice-president of the L. F. Benton Co., which manufactures screw machine products at Vergennes, Vt. Sutherland retired from the Splitdorf company about six months ago after a service covering several years. He first represented the company on the Pacific coast, then in Europe during the war and later was in charge of its branches. When C. W. Curtiss resigned as general manager of the Splitdorf company, Sutherland was elected to succeed him.

Vincent Bendix Is Married

Announcement is made of the marriage of Vincent Bendix, inventor of the Bendix drive and director of the Parrett Tractor Co., to Mrs. Elizabeth Ashton at the home of the bride's parents, Mr. and Mrs. James Harrison Shannon in Chicago. Mr. and Mrs. Bendix will live in East Walton Place, Chicago.

Kraus Appointed Export Manager

H. L. Kraus has been appointed export manager for the Milwaukee Motor Products, Inc., Milwaukee, Wis., manufacturer of timers. Offices have been opened at 130 West Forty-second Street, New York.

C. W. Matheson Promoted

C. W. Matheson, who has been general sales manager of Dodge Brothers Motor Car Co. since 1920 has been promoted to vice-president in charge of sales. John A. Nichols, Jr., director of field operations, becomes general sales manager and John H. Gordon, director of distribution.

Smith on N. A. C. C. Committee

Frank E. Smith, president of the Republic Motor Truck Co., has been added to the membership committee of the motor truck committee of the National Automobile Chamber of Commerce.

Farrington Heads Branch

W. H. Farrington has been elected president and general manager of the Maxwell-Chalmers Sales Co., the Chicago factory branch of the Maxwell-Chalmers Corp. He succeeds J. H. Willson who goes to Dodge Brothers to have charge of the foreign sales. Willson formerly was in charge of foreign sales for General Motors Corp. Farrington has been with the Maxwell-Chalmers Sales Co. for five years and has been in the automobile business in Chicago for 16 years.

Sharon Adds Representatives

Two additional sales representatives have been appointed by the Sharon Pressed Steel Co. They are W. C. Aines, who will have his offices at 20 East Jackson Boulevard, Chicago, and Ralph E. Philips, whose headquarters will be at 66 Broadway, New York City.

Heffley at New York Office

C. C. Heffley has been appointed manager of the New York office of the Bethlehem Spark Plug Co., Bethlehem, Pa. In conjunction with looking after the general sales in that territory he will handle all export business for the company.

David Goes to St. Louis

J. W. David, for the past five years connected with the Philadelphia branch of the General Motors Truck Corp., has been appointed manager of the St. Louis branch to succeed C. E. Pagett, who has taken over the sales management for the De Luxe Auto Co., Oldsmobile distributor in St. Louis.

Flyum Succeeds Keller

G. M. Flyum, former manager of the Brooklyn branch of the Bearings Service Co., has succeeded N. B. Keller as manager of the Minneapolis branch. W. H. Richardson, former New York branch manager, has been named assistant sales manager and assigned to the Eastern district with headquarters at Detroit.

BOSCH DOUBLES FORCE

SPRINGFIELD, MASS., April 11—The American Bosch Magneto Corp. is employing twice as many workers as it did this time a year ago and is operating at about 50 per cent of capacity.

Highway Educational Committee Appointed

Plans Formulated for Propaganda Work—Conference Will Be Held in October

WASHINGTON, April 11—The appointment of the educational committee of the Highway and Highway Transport Committee, which met here on April 7, was announced to-day by the National Automobile Chamber of Commerce. The personnel is as follows: T. H. McDonald, chief of the Bureau of Public Roads; Roy D. Chapin, chairman of the Highways Committee of the N. A. C. C.; Dean F. L. Bishop, University of Pittsburgh; Col. W. Boggs of the War Department; Pyke Johnson, Washington representative of the N. A. C. C., and Dr. Walter C. John, acting director of committee.

Plans were formulated by the committee for the dissemination of educational propaganda for highway transport through the education of pupils in the fifth and sixth grades of the public schools, of which there are 16,000,000, according to a recent census.

The educational committee met with the two national program committees to outline programs for highway engineering and highway transport sections of the proposed second national conference on the educational aspects of highway transport.

The latter part of October was selected as the tentative time for the conference, to be held in Washington. It was proposed that the conference should last three days.

Electric Service Body Increases Membership

DETROIT, April 7—The Automotive Electric Service Association, comprising companies representing national manufacturers of electric equipment for cars, reports the addition of about twenty members since its annual meeting during the Chicago show, and is continuing vigorously its campaign for further enrollment.

Under its constitution, the association has been unable to entertain the proposal of the National Automotive Electrical Association to take over the entire membership of this organization, but has notified it that it will accept for membership all companies representing manufacturers affiliated with the Automotive Electric Association.

Sectional meetings of the association are planned as soon as the membership has been increased to a satisfactory point. A series of bulletins are now under way which will keep members and prospective members in touch with its activities.

Cooperation, Theme of Hoover Meeting

Conference at Washington Considers Possibilities of Trade Associations' Efforts

WASHINGTON, April 12—The automotive industry is well represented at the conference with Secretary Hoover today of representatives from trade associations in all lines of activity. The conference has been called to learn what trade statistics and data the Department of Commerce can hope to receive from trade associations and how best to disseminate this information when it is compiled.

While no place has been given on the program to a discussion of the rights of trade associations to gather trade statistics in view of the recent decision of the United States Supreme Court in the hardwood lumber case, it is not improbable that this highly important subject will be touched upon. The views of Secretary Hoover do not coincide entirely with those of Attorney General Daugherty on this question.

The National Automobile Chamber of Commerce is represented by J. Walter Drake, chairman of the foreign trade committee, and General Manager Alfred Reeves. The representatives of the Motor and Accessory Manufacturers Association include W. O. Rutherford, one of the vice-presidents; Sidney S. Myers, general counsel, and M. L. Heminway, general manager. The Rubber Association of America is represented by A. L. Viles, its general manager.

Lee to Hold Conference

All the associations within the industry which are interested in export trade will be represented at the conference called for to-morrow by Gordon Lee, chief of the automotive division of the Bureau of Foreign and Domestic Commerce. The purpose of the meeting is to discuss how best to co-operate in promoting the sale of American made automotive equipment in foreign fields. The meeting will be attended by the chairmen of the various export committees and the foreign trade secretaries of the various associations which have export divisions.

Reeves had conferences yesterday with W. P. G. Harding, Governor of the Federal Reserve Board; Secretary Hoover and one or two other Cabinet officers as well as with the trade associations committee of the United States Chamber of Commerce. Last night he attended a meeting of the American Association of Trade Executives to prepare for the Hoover meeting to-day.

Survey of Activities Made

WASHINGTON, April 12—The National Association of Manufacturers has completed a survey of trade associations and their activities, based on a questionnaire sent out some time ago. The great number of replies discloses that the associations are not only willing but anxious to make public their activities, and for the most part are also desirous of co-operating with the Government as well as with their own respective industries.

The associations which replied to the questionnaire represent on the average 64.9 per cent of the business of the country in their particular lines. Most of the associations declare that the primary course is to improve and extend acquaintance among the members in a certain industry. The elaboration of purpose is mainly toward the nationalization of trade association methods and aims.

The National Automobile Chamber of Commerce reported it did not collect statistics on costs, prices, consumption or distribution, but confined its activities to statistics on production of complete motor cars and motor trucks, which are published at intervals and annually. The reply of the organization to the questionnaire was that they give freely of their services whenever information is desired on matters relating to the automotive industry.

As to the handling of legislative questions and litigation, both national and state, the N. A. C. C. pointed out that it opposed continuation of discriminatory Federal excise taxes on motor cars and trucks and parts; favored reduction in tariff on automobiles imported; supported modifications in highway act designed to concentrate Federal funds on most heavily traveled highways, thereby reducing waste; supported movement for uniform state laws governing the use of motor vehicles.

Reports from the Motor and Accessory Manufacturers Association showed that it has no statistical department and its educational activities are largely those common to other trade associations. They declared that legislative problems are undertaken with other associations in the automotive industry through the channel of the Motor Vehicle Conference Committee.

Draw Bar Work Shows Tractor More Valuable

WASHINGTON, April 12—Analysis of the preliminary report of the survey made by the Department of Agriculture on the relative value of tractors on the farm as compared with horse power for draw-bar work shows that of the 354 farm owners reporting, 75 per cent found the tractor more profitable.

The cost of tractor operation in this work, the land averaging 500 acres, was $484 for the year, or $1.60 a working hour. These farmers also kept an average of 8.3 head of workstock, the cost of which for the year was $541.

Based on a total of $1,025 for draw-bar power, figures show that the tractors furnished more than half the power for 40 per cent of the cost of the entire draw-bar work.

There were great variations in the practices and costs on individual farms, and the results indicate that often the expense of using the tractors and keeping the workstock was excessive for the amount of work done.

U. S. Registration Bill Is Submitted

Revenue from Anti-Theft Act Would Be Used to Build Post Roads

WASHINGTON, April 12—Federal registration of motor vehicles would be mandatory under a bill introduced in the House by Representative Mills of New York. The measure, which has been referred to the Committee on Ways and Means, would provide for a $2 tax which would provide revenue for the construction of post roads as provided in the Federal Aid act of 1916. Ostensibly the main purpose of the measure is to curb automobile thefts by providing a permanent number for every car, and make it necessary to file with clerks of the United States court bills of sale for every motor vehicle sold.

Motor Vehicle Defined

The Mills bill defines the term "motor vehicles" as vehicles propelled by any power other than muscular, except motorcycles, traction engines, road rollers and such vehicles as run only upon rails or tracks. It stipulates that applications which must be filed to obtain registration blanks shall give the following information:

(*a*) A brief description of the motor vehicle to be registered, including the name of the manufacturer and factory number of such vehicle, the character and amount of the motive power stated in figures of horsepower in accordance with the rating established by the Association of Licensed Automobile Manufacturers.

(*b*) Whether the engine or body or any other substantial part of such motor vehicle ever constituted a part of a former motor vehicle registered hereunder; if so, then a statement of such prior registration number and the cause of the dismantling of such former motor vehicle.

(*c*) The name, age, residence and business address of the owner of such motor vehicle. Such application and statement shall be acknowledged and sworn to by the applicant before a notary public or other officer authorized to the acknowledgments to deeds and shall be filed with said clerk within four months after this act takes effect for all motor vehicles then in use on said post roads. Then and thereafter every such motor vehicle must be registered hereunder before the same may be sold and delivered by the manufacturer thereof or used on said post roads. Failure to comply with any of the provisions of this section shall constitute a misdemeanor punishable by a fine not exceeding $1,000 or by imprisonment.

Number to Be Given

The bill provides further that any motor vehicle driven upon the post roads of the United States upon which the tax has not been paid and which has not been registered as required by this act shall be subject to forfeiture to the United States. It is also provided that the clerk of the Federal Court shall assign to such motor vehicle a distinctive number which must be marked on the engine and outside body.

New York Territory Gained in Quarter

This Year 11,792 Passenger Cars Were Registered—Last Year Total Was 6,330

NEW YORK, April 10—New passenger cars registered in the first three months of 1922 in ten counties in and around New York numbered 11,792, as compared with 6330 in the same period last year. March registrations also showed a gain of almost three to one over January and February, respectively.

Ten cars in the medium and low priced classes have registered more than 200 each since Jan. 1, four of these having more than 1000, one almost 1000 and the remaining five running from 225 up to almost 300. In the high priced class seven cars have registers of more than 40 for the three months.

A summary of registrations for the ten counties, taken from the monthly report of Sherlock & Arnold, publishers of the Automobile Sales Analysis, is as follows:

Cars below $2,500

	1922	1921
January	2,019	483
February	2,231	1,409
March	6,354	3,396
Total	10,604	5,288

Cars $2,500 and above

	1922	1921
January	283	145
February	273	210
March	632	487
Total	1,188	842

Durant Will Produce 200,000 Stars in 1923

(*Continued from page* 833)

which will include several states. These factory branches will appoint distributors and they in turn will appoint dealers. Each distributor will be required to name a large number of dealers who will agree to provide parts and service for the Star.

W. C. Durant has not yet decided definitely whether or not he will acquire the Elizabeth factory of the Willys Corp. for use as an assembling plant for the Star. Negotiations still are pending.

Awards Frame Contract

NEW YORK, April 13—Durant Motors, Inc., announces that the frame contract for the new Star car has been awarded to the Parish & Bingham Corp. of Cleveland.

800 Cars at Muncie for April

MUNCIE, IND., April 11—The tentative schedule for April for Durant Motors, Inc., at its plant here calls for the manufacture of 800 cars and it is the hope of the company to complete 5000 cars by August, the end of the company's fiscal year.

During March more than 500 Durant sixes were produced and shipped to points in the United States and Canada. There are now 460 persons on the payroll, which is an increase of 110 over March 1.

On the Up Grade

PHILADELPHIA, April 8—L. H. Gilmer, manufacturer of woven products, reports that total sales for February exceeded those for any month for a year and a half. March business showed an increase over February of more than $30,000, and on a tonnage basis the shipments exceeded any month in the company's history.

CHICAGO, April 10 — The Stewart-Warner Speedometer Corp. reports that its sales for March were the largest of any single month since June, 1920. The increase over March of last year was 140 per cent. The first quarter of 1922 showed 110 per cent increase over the corresponding period of last year. Orders received for April shipment indicate that sales this month will be greater than in any April in the company's history.

STOUGHTON, WIS., April 10—New orders for trucks for a wide variety of purposes, principally passenger buses, farm dairy and milk hauling vehicles and the lighter types of delivery cars for merchants, have made it necessary for the Stoughton Wagon Co. to increase its working force and also extend the schedules of its motor truck division.

DETROIT, April 8 — During March the Packard Motor Car Co. received more orders for both twin sixes and single sixes than could be shipped. Men on the payroll number 4700, and some departments are working nights. Truck sales continue to expand.

SYRACUSE, April 8—Franklin Automobile Co. shipments for the week ending April 1 exceeded shipments for the entire month of February. Shipments during the week were the largest for any week during the last nine months.

NEW YORK, April 10 — The Metal Stamping Co., manufacturers of Lion bumpers, reports that March was the biggest month in its history. The output of bumpers exceeded 34,000.

BUSINESS BEST IN TWO YEARS

PHILADELPHIA, April 11—According to David Ludlum, president of the Autocar Co., business is better now than at any time in the last two years. The crisis in business is now regarded as passed, and the future is particularly encouraging.

Used Car Situation Has Brighter Tinge

Dealer Responses to Paige Questionnaire Indicate Demand Is Strengthening

DETROIT, April 7—Responses received by the Paige-Detroit Motor Car Co. to a questionnaire sent out to leading distributors are taken by the factory to indicate a gradual increase in the used car demand and a very definite strengthening of dealer confidence in the ability to overcome the used car situation.

Continued stagnation in used car stocks is ascribed by the factory only to those dealers who have been unwilling to write off the differences between original allowances on cars and present market values. Where the dealer has reduced his prices to make them conform to newly created values he has had little difficulty in bringing his stock down.

Paige finds a practice growing among its dealers of taking in cars at allowance which permits them to make a quick resale at a small profit. Though there is is a great deal of competition for sales still, the questionnaires would indicate a great deal of conservatism in allowances made by dealers on the exchanged cars.

April Brings Chicago Best Week This Year

CHICAGO, April 7—A decided pick-up in the retail sales of automobiles in Chicago is indicated by the time-payment sales for the week ending April 1 in which 1003 chattel mortgages to secure deferred payments were filed for record. The time-payment sales for the preceding week were 672 and for the week before that 873, the highest for any week of this year up to that time.

C. L. Wolf, secretary of the Central Automobile Financing Association, who compiled the figures, said that low or medium priced cars predominated in the sales for the week ending April 1 to a greater extent, probably, than in any previous week.

Dealers also tell of increased sales of the lower priced cars and trucks. One dealer handling a car under $1,000 and one selling around $1,500 said his sales for March exceeded his total sales for the preceding three months combined.

ARGENTINE DEMAND BETTER

WASHINGTON, April 12—A cablegram received from Commercial Attache Feely at Buenos Aires says that the demand for moderate and low-priced motor cars in Argentina is improving. March imports from the United States of passenger cars, not including Ford, totaled 301, chassis three, and motor trucks three, as against 42 passenger cars, 28 chassis and eight motor trucks from Europe. Sixty-four motors cars of American and 22 of European makes were imported during the corresponding month last year.

Threaten to Punish Bus and Truck Users

Petitions Reach California Merchants—Railroad Employees Start Boycott

SAN FRANCISCO, April 10—What is looked upon as the most serious movement thus far to curtail the development of motor truck shipping and passenger transportation in California came to light recently at Roseville, Cal. Petitions have been circulated among the merchants of the town asking them not to patronize truck shipping lines under the implied threat of boycott and members of at least one union composed of railroad employees have been notified officially that a stage line has been put on the "We Don't Patronize" list, and if members use the stages they will be subject to fine.

Attempt to Throttle Competition

Roseville is similar to hundreds of "railroad towns" in the United States. The Southern Pacific has repair shops there and they are one of the chief sources of revenue to the community. California had a reputation for years as a railroad-owned state.

The railroads are leaving no stone unturned in their attempt to throttle motor competition. When an applicant for a stage or freight franchise appears before the State Railroad Commission his plea almost invariably is fought by attorneys for the Southern Pacific, Union Pacific and Santa Fe lines. Railroad representatives are addressing the Chambers of Commerce of the various cities and towns.

The most common appeal is that railroads have been responsible for the growth of the community and that freight trucks and stages are jeopardizing their investment. The chambers are told the motors not only are cutting into railroad revenue, but are wrecking the roads built by the people, and that the income derived by the state from these sources is far too small. It is evident that steam and electric carriers would have the motors so burdened by special taxes and the weight restrictions so severe that this competition would be killed by strangulation.

Bitter Toward Motor Vehicles

In addressing a meeting of the Progressive Business Men's Club at Bakersfield, Cal., recently, R. E. Kelly, representing the executive department of the Southern Pacific, protested bitterly against the motor carriers. After reviewing railroad statistics on investments, payrolls, taxes, etc., and pointing out that the railroads maintain their own roadbed and rights of way, and highways are built by public expenditure and are maintained in the same way, Kelly said:

> You are business men and know how much you benefit from the payrolls of the railroad companies and from their purchases of supplies here. Southern Pacific men and their families buy their groceries, their clothes and other necessities of life here. They buy or build their own homes and pay city taxes. When the railroad business prospers they prosper, and the city and other citizens benefit thereby. When the railroad business suffers, as it has in the last year, fewer men are employed, the payrolls shrink and this has a depressing effect on other business. The motor transportation problem is your problem. It is an important problem because it deals with dollars—your dollars.

Railroads have their agents, attorneys or other dependents in almost every locality, although it is estimated there are more than 200 towns in California wholly dependent on motor transportation.

The situation has reached such an extreme that there are boards of county supervisors in the state which have passed resolutions directed to the railroad commission petitioning that body not to issue franchises to motor carriers to serve the same communities that have railroad accommodations until such time as the motor carriers are made to pay their "fair" share of the state taxes. Chambers of Commerce, merchants' associations and other similar organizations throughout the state have been induced to pass similar resolutions.

At Roseville, for the first time on record, the cards have been placed on the table. In this instance, however, the railroads as such are not the active players. The way is left free to declare the action "unauthorized" and "unofficial."

Wages Are Involved

Employees are quoted as having said the railroads claim they cannot afford to continue paying the present wage scales because of inroads on their business by motor carriers. The deduction that employees themselves must take some steps to oppose motor competition if they want their wages maintained, is obvious.

Merchants of Roseville have signed a sworn statement to the effect that G. O. Seward, who represented himself as being president of the Brotherhood of Railway Clerks No. 1044, and a committeeman from the Roseville Labor Council, called on them at their places of business and asked them to sign an agreement not to patronize motor trucks hauling freight into Roseville and not to patronize the stages. The reason assigned for the request was that Roseville was largely supported by the railroad and that the members of the railroad forces were union

(*Continued on page* 846)

SAXON STARTS AT YPSILANTI

DETROIT, April 12—The Saxon Motor Car Co. has started operations in the plant taken over from the Apex Motor Corp. at Ypsilanti on a schedule of five cars daily. This total will be increased to 10 within two weeks. Harry L. Bill, vice-president, is in charge of operations, with Carl H. Becker in charge of sales and D. C. Bayne, secretary and treasurer. The company reports orders on hand covering several months' production. The new plant affords 32,000 sq. ft. of floor space in a modern reinforced concrete structure.

Industry Meets Film Makers at Washington

Department of Commerce Represented — Reels Would Be Used in Export Trade

WASHINGTON, April 11—Impetus to the movement by national organizations to advertise their products abroad through the medium of educational moving picture films was given when representatives of 25 associations met here with officials from the Department of Commerce.

The automotive industry was represented by Alfred Reeves, general manager of the National Automobile Chamber of Commerce; J. Walter Drake, chairman of the Hupp Motor Car Corp., and George F. Bauer, manager of the foreign trade department of the chamber.

In the automotive field it is proposed that educational films be made showing every phase of the manufacture of automobiles, their utility features and the importance and economics of highway transportation.

The delegates, while here, met with Governor W. P. Harding of the Federal Reserve Board and discussed credits and business conditions throughout the country, especially as they concerned the automotive industry.

The consensus of the delegates, following the interview with Governor Harding, is that the present gain in business "is a steady, healthy growth and is not a spurt."

Agricultural Inquiry Report Far Reaching

WASHINGTON, April 13—Chairman Anderson of the Joint Commission on Agricultural Inquiry announced to-day that the forthcoming transportation report would carry broad and far-reaching recommendations to Congress bearing chiefly on governmental contracts with all transportation systems and agencies, and about an equal number of findings and conclusions addressed to transportation management to producers and shippers.

It is said that the recommendations will include the question of highway transport development. Because of the effect of motor trucks on the extension of the farmers' market and the general growth of rural life, the commission gave particular attention to this phase of the transportation problem.

MAXWELL-CHALMERS SESSIONS

DETROIT, April 13—Maxwell-Chalmers sales supervisors from all parts of the United States are assembled at the factory for a three-day convention. Arthur E. Barker, vice-president in charge of sales, opened the convention. Other speakers were John J. Plath, Maxwell, director of sales, and A. T. Stanton, director of service.

FINANCIAL NOTES

Ajax Rubber Co. for the year ended Dec. 31, 1921, reports a total loss of $5,205,577 against $1,333,368 in 1920. The heavy loss was after deducting all expenses, making provisions for depreciation and for rebates due to price reductions and writing down the cost of fabric and crude rubber used during the year in excess of amounts charged to manufacturing costs, together with the amounts necessary to reduce inventories to market prices. In his statement to the stockholders, Horace De Lisser, chairman of the board, said: "The business of the company is now upon such a plane that the predictions of your management heretofore made as to the prospects for the year 1922 may be looked upon as reasonably likely of fulfillment, as rather substantial earnings have already resulted from business operations during the first quarter of the present year."

Stromberg Carbureter Co. reports net profits of $81,670 for the year 1921 after all charges for Federal taxes and interest. This is equivalent to $1.08 a share on the capital stock outstanding. Profits in the previous year were $340,101. The total income of the company for the year was $323,923 as compared with $787,443 for 1920. The profit and loss surplus at the close of 1921 was $2,434,339 against $2,344,943 at the end of 1920. Cash on hand amounted to $232,459, notes and accounts receivable $203,763 and inventory $522,117. Accounts payable totaled $55,894. Notes payable amounting to $150,000 were paid off during the year.

Keystone Tire & Rubber Co. for the year ended Dec. 31, 1921, reports net loss of $678,039 after expenses, interest and taxes as compared with net loss of $317,705 in the previous year. The balance sheet shows notes and accounts receivable of $1,353,473 against $2,437,903 in 1920, and an inventory of $368,265 on the 1921 date compared to $860,921 the year before. Notes payable are listed at $295,000 against $448,597, and accounts payable of $121,644 compared to $255,092.

Velie Motors Corp. has filed with the Illinois Secretary of State a certificate of the decrease of its capitalization. The par value of common stock has been reduced from $25 to $10 a share. The total stock value is lowered from $2,000,000 to $1,200,000.

Portage Rubber Co. creditors will receive an initial payment of 40 per cent on their claims from funds received from the purchasers of the plant and inventory. The payment will be made upon recommendation of the trustee in bankruptcy.

Fisher Body Corp. has declared the regular quarterly dividend of $2.50 on the common and 1¾ per cent on the preferred stocks, both payable May 1 to stock of record April 21.

Kelly Springfield Tire Co. has declared a quarterly dividend of $2 on the 8 per cent preferred stock, payable May 15 to stockholders of record May 1.

Dort Motor Car Co. stock to the number of 75,000 shares no par common is being offered through McClure, Jones & Reed for $20 a share.

Allis Chalmers Manufacturing Co. has declared a dividend of $1 on the common stock payable May 15 to stockholders of record April 24.

BETHLEHEM WINS SUIT

PHILADELPHIA, April 8—Charges of infringement and the use of unfair competitive methods brought against the Bethlehem Spark Plug Co., Bethlehem, Pa., by the Helfi Co., Belvidere, Ill., have been disposed of by the United States Appellate Court in a decision which declares invalid the patent rights claimed by the latter company. The decision affirms that of the United States District Court in 1921, from which the Helfi Co. took an appeal.

(BULLETIN)
PIERCE-LAFAYETTE MERGER

NEW YORK, April 13—Announcement was made here late to-day that directors of the Pierce-Arrow Motor Car Co. and the Lafayette Motors Co. have agreed, in principle, upon a plan to consolidate the corporations. C. W. Nash will become chairman of the board of the consolidated company and will have entire charge of the operating management. Nash Motors is not involved in the arrangement in any way.

Waivers Assure Success of Walker Financing Plan

CLEVELAND, April 8—Waivers to 70,000 shares of the stock of H. J. Walker Co. have been received from stockholders in response to the notification sent out by the company that the reorganization syndicate would proceed with the refinancing plan. The success of the plan was contingent upon releases being received to 65,000 shares.

Receivers Have Chance to Sell Texas Motors

FORT WORTH, April 8—Steps to remove the Texas Motor Car Association from receivership and to halt the bankruptcy proceedings so that the $4,000,000 plant here can be sold, have been taken before United States Judge Wilson.

The latter proceedings were begun before Judge Wilson by Chicago and Indianapolis creditors. At that time two receivers, who had been appointed by the State court, were in charge of the factory. The receivers now have a chance to sell, it is said, but cannot until the court renders a decision, which is expected in several weeks. In the meantime the plant is closed with the exception of the body department.

Bill Signed for Higher Fees in New York State

ALBANY, April 10—Governor Miller has signed a bill increasing from $10 to $16 the cost of registering a two-ton motor truck and providing an additional tax of $8 a ton for each ton above two. Another bill signed by him provides a fee of 30 cents per 100 lb. for the registration of automobiles of 3500 lb. weight or less and 75 cents per 100 lb. if the car weighs more than 3500 lb.

Other motor vehicle bills signed by the Governor provide for the approval by the State Tax Commission of headlights used on automobiles and directing the Tax Commission to make frequent inspection of motor trucks operating on state highways to detect violations of the law in regard to overloading.

Last week's local money market displayed continued ease. Call money ranged between 4½ per cent and 5 per cent, as compared with 4 per cent to 5 per cent in the previous week. For time money the situation remained essentially unchanged, fixed date funds being in more liberal supply, but in small demand. The range continued the same as for the previous week, 4½ per cent for sixty and ninety days and four months and 4½ per cent to 4¾ per cent for five and six months' maturities. The range for prime commercial paper remained unchanged at 4½ per cent to 4¾ per cent.

The Federal Reserve statement as of April 5 showed an increase of $7,846,000 in gold reserves and $6,222,000 in total reserves. Total bills on hand decreased $15,370,000, while total earning assets decreased $6,530,000. There was a decline of $692,000 in total deposits, while Federal Reserve notes in actual circulation showed an expansion of $16,229,000. The reserve ratio declined from 77.8 per cent to 77.7 per cent.

The United States Steel Corp.'s monthly report of unfilled tonnage issued April 10 showed a total of unfilled orders on the company's books as of March 31, 1922, of 4,494,148 tons, the highest reported since last September. This total marks an increase of 353,079 tons during the month and compares with 6,284,765 tons on March 1, 1921.

The pig iron output in March reached over 2,000,000 tons, which is the first month since January, 1921, in which production passed the two million ton mark. The daily average reported output for the month of March was over 65,000 tons.

BANK CREDITS
Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW ELGIN DIRECTORS

CHICAGO, April 13—Stockholders of the Elgin Motor Car Corp., which is getting its factory in shape for the production of a series of new models, have elected four new directors. They are A. V. Martin of the State-Lake Bank, Chicago; William Lister, an attorney, and H. W. Jones and J. F. Cornelius, Chicago business men. Members of the board re-elected are C. S. Rieman, president; F. L. Brown and W. G. Knoebler. Prices of the new line have not been announced except that of the phaeton, which will sell at $1,695, which is an advance of $300 over the present model.

WHITE 20 PER CENT BETTER

CLEVELAND, April 13—The White Motor Co. reports that its March orders were approximately 20 per cent higher than for any month since May, 1920, and that deliveries exceeded any month since September, 1920. Business for the first quarter in both orders and deliveries shows a material increase over the same quarter last year. Loans have been reduced since Jan. 1 to $3,300,000, with more than $2,500,000 cash on hand after a dividend payment of $500,000 on March 31. All branches reported decided improvement.

INDUSTRIAL NOTES

Universal Tool Co., a New Jersey corporation, has purchased the business conducted at Garwood, N. J., by the Universal Tool Co., a Michigan corporation, which has been in the hands of a receiver for several months. The sale included all the assets of the latter company except its accounts receivable, which should be paid to Thomas H. Keating, the receiver, in Newark. The company expects to enlarge the scope of its manufacturing in the immediate future. The officers are Robert E. Roseberry, president; H. R. McGraw, vice-president; Donald McGraw, treasurer, and G. J. Miller, secretary.

American Felt Co. has opened a modern unit in Detroit for the cutting and fabrication of felts of its own make for the automotive industry. The move is made as a result of the growth of its business in that section and through locating in the center of automotive activities the concern hopes to effect a number of economies as pertain to shipments. The company has also taken into consideration the better service possible and greater convenience for contact between automotive engineers and its own. Principal offices of the concern are located in New York, Chicago and Boston.

Martin-Parry Corp. has closed a lease with the New Orleans Metal Bed Co. whereby it comes into possession of 10,000 sq. ft. of floor space which it will use as a branch for its products, covering Louisiana and most of Mississippi. This is the fourth distributing center to be established in the South by the body builders, the others being at Atlanta, Houston and Dallas. A. Mitchell is manager of the New Orleans branch.

Industrial Engineering Co. has opened offices in the Peoples' Bank Building, Akron, as consulting and designing engineers on automatic, special and production machinery for the automotive and machinery building industries. Members of the firm are L. C. Hosfield, George C. Winchel, J. C. Sinclair and W. F. Clark.

B. F. Goodrich Co. will hold its annual meeting on April 19, when six three-year directors will be chosen by the common stockholders. A special meeting will be held on the same date for the purpose of conforming the certificate of reorganization to the state corporation law of New York.

Bull Dog Tractor Co., Fond du Lac, Wis., has filed an involuntary petition in bankruptcy. The concern originally was formed at Oshkosh but moved its offices and factory to Fond du Lac about 18 months ago. No statement of assets and liabilities is available at this time.

Eisemann Magneto Corp. will remove its Chicago branch to 2005 South Michigan Avenue on May 8. The change results from the necessity of occupying larger quarters. All repairs will be made in the new branch and a complete stock of magnetos and parts will be carried.

Standard Auto Supply Co., New York, creditors have filed a petition in bankruptcy against Louis A. Weinstein, trading under that name. It is stated that the liabilities approximate $60,000 and the assets $20,000. H. Willis Smith has been appointed receiver.

Duplex Storage Battery Co., Beaver Dam, Wis., has filed a voluntary petition in bankruptcy, scheduling its liabilities at $74,462 and claiming assets of $58,895. Unsecured claims amount to $67,497.

Missouri Car Co. of St. Louis has purchased a 10-acre tract in East St. Louis to manufacture street car equipment and to build bus and commercial vehicle bodies to specification.

Canton Art Metal Co. has removed its sales office from 200 Fifth Avenue, New York, to the Canadian Pacific Building, 342 Madison Avenue.

Wants Chicago Show Shifted to St. Louis

ST. LOUIS, April 9—A campaign to change the holding of the national automobile show from Chicago to St. Louis has been inaugurated by Webster Colburn, vice-president and general manager of the Dorris Motor Car Co. Colburn has urged the change in letters to Alfred Reeves, general manager of the N. A. C. C., as well as to each member of the chamber.

Colburn's letter to Reeves declares inadequate the Coliseum and Armory in which the Chicago show has been held for years. Visitors, he says, are obliged to walk through "Pneumonia Alley," which connects the buildings, a serious matter in the midwinter weather which prevails at the show season, and making necessary a system of time limit transfer.

He directs attention to the large Chevrolet building in St. Louis, used in the last two local automobile shows, which provided space on one floor for passenger cars, trucks and accessories.

"More Important" Work Halts Graham Resolution

WASHINGTON, April 11—Consideration of the Graham resolution placing a 90 per cent ad valorem tax an all reimported goods was postponed to-day, when it came up in the Senate, by objection of Senator King of Utah, who insisted that there was more important legislation pending.

Under the provisions of the resolution, which has been endorsed by automobile and supply dealers, as well as by practically every national association of retailers and manufacturers, would prevent the dumping and underselling of cheaply bought government war supplies, on the American market, after they had been purchased abroad.

DEALERS ORDERING TRUCKS

KENOSHA, WIS., April 12—Truck business of the Nash Motors Co. has shown a decided increase in the past 60 days. Dealers in practically all sections of the country, according to General Sales Manager C. B. Voorhis, are ordering trucks in larger numbers than at any time during the past 18 months.

CORRECTION

DETROIT, April 11—AUTOMOTIVE INDUSTRIES was in error in its issue of April 6 in giving the name of the newly incorporated successor to the Lincoln Motor Co. as the Lincoln-Ford Motor Car Co. The name of Ford is not included in the title of the new corporation, which is the Lincoln Motor Car Co.

METAL MARKETS

It is an old trade axiom that the steel market is either a feast or a famine affair, and recent press reports have tended to create the impression that it is once more in the midst of one of its feast periods. Market reporters have had to subsist so long on monotonously drab news that they may well be forgiven for waxing enthusiastic over the change in sentiment that has come over the market, and thus convey perhaps an exaggerated picture of its improvement, which, after all, lies more in the producers' point of view than in an abnormal betterment of the demand. As a basis for commitments on the part of steel buyers it will be well to bear in mind that the enhanced morale of sellers is predicated far more upon expectations than upon present conditions.

The best that can be said for mill operations, from which one may deduce the actual and not the anticipated demand, is that by and large they have reached the 1914 parity. Compared with what the demand was earlier this year this is a notable achievement. At the same time it is only two-thirds of total capacity.. Moreover, the steel now being rolled and the visible backlog of orders carry old prices and so far there are no indications of any representative buying at the advanced levels which became effective as asking prices on April 1. In some steel products higher asking prices, while justified on the basis of advances in the raw material, are out of alignment with the demand.

So, for instance, some producers of cold-rolled strip steel have marked their price up $3 a ton, although the demand, emanating almost solely from the automotive industries, is hardly in excess of 50 per cent of capacity. Naturally high prices make it just so much the more difficult for producers to augment the rate of operations. Undoubtedly there is a latent demand for steel from many industries, other than automotive manufacture, which has so far been suppressed either artificially or by force of circumstances.

Pig Iron.—Nearly all of the passenger motor car builders have figured recently as buyers in the foundry market, presumably at fractional concessions from the $20 level, which is now the prevailing quotation in the Chicago market.

Steel.—Higher prices are asked for virtually every steel product used in the automotive industries, but fresh buying at these higher prices appears to be in abeyance. Large tonnages of bolts and nuts were contracted for by automotive interests before advances became effective.

Aluminum.—There has been a noteworthy broadening of the demand from the automotive industries. The market has turned strong at previous quotations. Opinion in the trade is that Germany will be able to continue exportation of sheets to the United States, even though the proposed duty of 9 cents per lb. should become part of the tariff law, this because of her cheap labor. Importers are reluctant to quote on July and August deliveries because of tariff uncertainty.

Nickel.—Of considerable interest to the automotive industries is the recently announced reduction in nickel prices by the leading producer. This price cut should tend to broaden the use of nickel steel and nickel-chromium steel. The "outside" market had for some time ruled below the chief interest's quotations, but the latter's price cut is indicative of an energetic policy to broaden the use of nickel, especially in automotive construction.

Calendar

SHOWS

April 3-16—New York, Second Annual Electric Automobile Show, Showroom of the New York Edison Co.

FOREIGN SHOWS

March 10-July 31—Tokio, Japan, Peace Exhibition.

April 16-23—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czecho-Slovakia, Fourteenth International Automobile Exhibit.

May — Shanghai. Exhibition of Road Building Material.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

May 1-15 — The Hague. Automobile Show, also Airplanes and Motorboats. Secretary, Spui 185, The Hague.

May 6-21—Scheveningen, Automobile Show.

May 24-June 5—Barcelona, Spain, Automobile Show under Dealers' Direction.

May. 28-June 5—Prague. Motor Show. Hotel de Ville.

July 1-24—London (Olympia). Aircraft Exhibition.

Sept. 1922 — Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Associação Automobilista Brazileria.

Sept. 15-20—The Hague. Automobile Show.

September—Buenos Aires, Argentina, Annual Exhibition, Sociedad Rural Argentina.

October — Paris, Automobile Show.

Oct. 12-23—London (Olympia). International Commercial Vehicle Exhibition.

Nov. 3-11 — London (Olympia). Automobile Show.

Nov. 10-Dec. 19 — Brussels. Automobile Show, Palais de la Cinquantenaire.

Nov. 29-Dec. 4—London (Olympia). Cycle and Motorcycle Show. British Cycle Motors, The Tower, Warwick Road, Coventry.

November—Buenos Aires, Argentina, Annual Exhibition, Automovil Club Argentino.

CONVENTIONS

April 20-22—Buffalo, N. Y., Sixth Annual Convention of the American Gear Manufacturers Association.

May 8-10—New York, National Association of Manufacturers.

May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

May 12—New York, Annual Meeting, National Highway Traffic Association, at the Automobile Club of America.

May 16-18—Washington, D. C., Annual Meeting of the Chamber of Commerce of the United States.

May 22-25—New York, Palisades Interstate Park, Second National Conference on State Parks, Bear Mountain Inn.

June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

June 19-24—Colorado Springs, Summer Meeting, Automotive Equipment Association.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28 - Sept. 2 — Detroit, National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

Detroit, April 21, May 26.

June 20-24 — White Sulphur Springs, W. Va., 1922 Summer meeting of Society of Automotive Engineers.

Threaten to Punish Bus and Truck Users

Petitions Reach California Merchants—Railroad Employees Start Boycott

(*Continued from page* 843)

men. As such it was much better for them to have the railroads patronized in preference to the trucks and stages. The affidavit also says the subscribing witnesses were told by Seward that unless they signed the agreement employees of the railroad would be notified not to trade with them, and if the employees did deal with those merchants, Seward would use his influence to have the employees discharged.

As further evidence of the attempt at railroad union "blacklisting," there is cited copy of a notice signed by J. L. Longhurst, recording secretary, and said to have been sent to members of the United Brotherhood of Carpenters and Joiners of America. This notice states that at a meeting of Roseville Local No. 1147 action was taken authorizing a fine be levied on members who patronize the Roseville-Sacramento stage line. This fine is to be $1 for the first violation of the order and $5 for the second and subsequent offenses.

The outcome of these tactics is that some of the merchants of Roseville expect to comply with the demands of the unions. Others so fear the loss of railroad employee business that they say they contemplate advertising in the local newspaper "We are 100 per cent Southern Pacific Merchants." The operator of a truck freight line stated that previous to the action of the unions his income from daily haulage into Roseville averaged about $20, but since the manifesto it has been no more than $2. The driver of the Roseville-Sacramento stage reports the ban is being felt by him. The morning of March 25 he had only 44 passengers, nearly all women and salesmen, and he did not recognize one union man among his patrons.

Protest has been made to the Railroad Commission of California by representatives of the motor carriers, but that body claims to have no jurisdiction. There is some talk of taking the matter into the courts on the grounds of collusion, but this probably would be difficult to prove. Railroad employees claim they have not forgotten that at the time of the last railroad strike in California complete transportation stagnation was prevented solely by motor carriers. In the Roseville instance, some of them say, they are battling a foe common to both the interests of themselves and their employers.

AMERICAN PRICES LOWERED

PLAINFIELD, N. J., April 13—Reductions in the prices of its various models are announced by the American Motors Corp. They follow:

	Old Price	New Price
5-passenger Phaeton....	$2,195	$1,850
7-passenger Phaeton....	2,195	1,925
4-passenger Sport.....	2,250	1,995
5-passenger Sedan.....	3,150	2,695

MIDWEST REORGANIZATION

INDIANAPOLIS, April 13—Plans for the reorganization and refinancing of the Midwest Engine Co. are so nearly completed that for the purpose of clearing titles, etc., the reorganization committee has taken the final step and had receivers appointed. Business will be carried on in the usual manner. Production and sales activities will continue without interruption. Lon R. Smith will be sales manager under the direction of O. E. Stevens and Frederick Van Nuys, the receivers.

Federal Tax Greater Than Wage for Labor

For Every $1 on Payroll in 1921, General Tire Company Paid Government $1.10

AKRON, April 8—"Supporting American industry's contention that present high taxes tend to cripple development and even to drive active capital into hiding, we have compiled figures showing that for every dollar our company paid last year to our productive labor we paid $1.10 in taxes," announces William O'Neil, vice-president and general manager of the General Tire & Rubber Co.

The General company's total taxes exceeded the amount paid productive labor by 10 per cent, while the company's excise tax alone for 1921 was larger by $1,000 than the productive labor payroll. Total taxes paid by the company, O'Neil states, were over 88 per cent of the entire payroll covering productive and all other kinds of labor for the year.

In the last three years, the company estimates, General has paid nearly three times as much in taxes as in dividends to stockholders, all of whom paid one hundred cents on the dollar for their holdings. The General company was one of the few tire companies in the country to continue dividend payments during the slump period, General preferred stock earning 8 per cent dividends and common stock earning 10 per cent last year.

HARPER DISTRIBUTES DURANT

NEW YORK, April 11—R. H. Harper, who formerly was head of the Harper-Overland Co. in Washington, has been appointed distributor of the Durant line for the District of Columbia, Virginia and parts of West Virginia, Maryland and Tennessee.